What's in this issue—

Meet H. P. Cleaver, works manager of the J. G. Brill Co. With Bethlehem Steel for eight years, six of which were spent as assistant superintendent of the company's Harlan car-building plant at Wilmington, Del., he has been connected with Brill since 1926. He supervised Brill production in the difficult period caused by transition from exclusive construction of cars to manufacture of motor buses, trolley

H. P. CLEAVER

buses and cars of radically new designs. He tells you on page 112 how Brill has worked out the problem of making products which call for a **production system midway between straight-line assembly and the individuality of a contract shop.**

Three companies—American Tool Works, Firth-Sterling and Westinghouse—tell on page 108 what they are doing to **control and dispose of chips from metal-cutting machines.** The article, second in a series of three, is full of usable information.

C. P. Nellis is the author of the article on page 104 which gives the "low-down" on how Inland Manu-

C. P. NELLIS

facturing Division of General Motors makes clutches. He is factory manager at Inland, has been with the company since 1922. For 10 years he was connected with the famed Dayton Wright Co. Among other things, he describes a new type of **flattening furnace for heating and pressing steel disks into proper shape. Tooling set-ups also are described** and pictured.

How much do you know about **a.c. arc welding?** E. F. Steinert of Westinghouse brings you on page 117 the facts regarding advantages and limitations of such welding compared with the d.c. method. The article is accompanied by informative diagrams.

The Glenn L. Martin plant at Baltimore is now turning out "Ocean Transports" which are the first air liners capable of non-stop transatlantic commercial transport (46 passengers, mail and cargo). Turn to page 101 to see, largely in picture form, how they are built. **Though custom-made, these flying ships are fabricated wherever possible by methods patterned after regular production procedure.** Riveting is widely used.

The matter of **reducing closed ends of deep-drawn steel shells** isn't so hard if you use a simple rolling process on a trimming and beading lathe. Details of how to do it, with photographs and drawings, are on page 115.

How much consideration should be shown a new man in the shop? This question is the basis for the Round Table discussion which is a feature of each issue. Page 122.

COMING

In the next issue

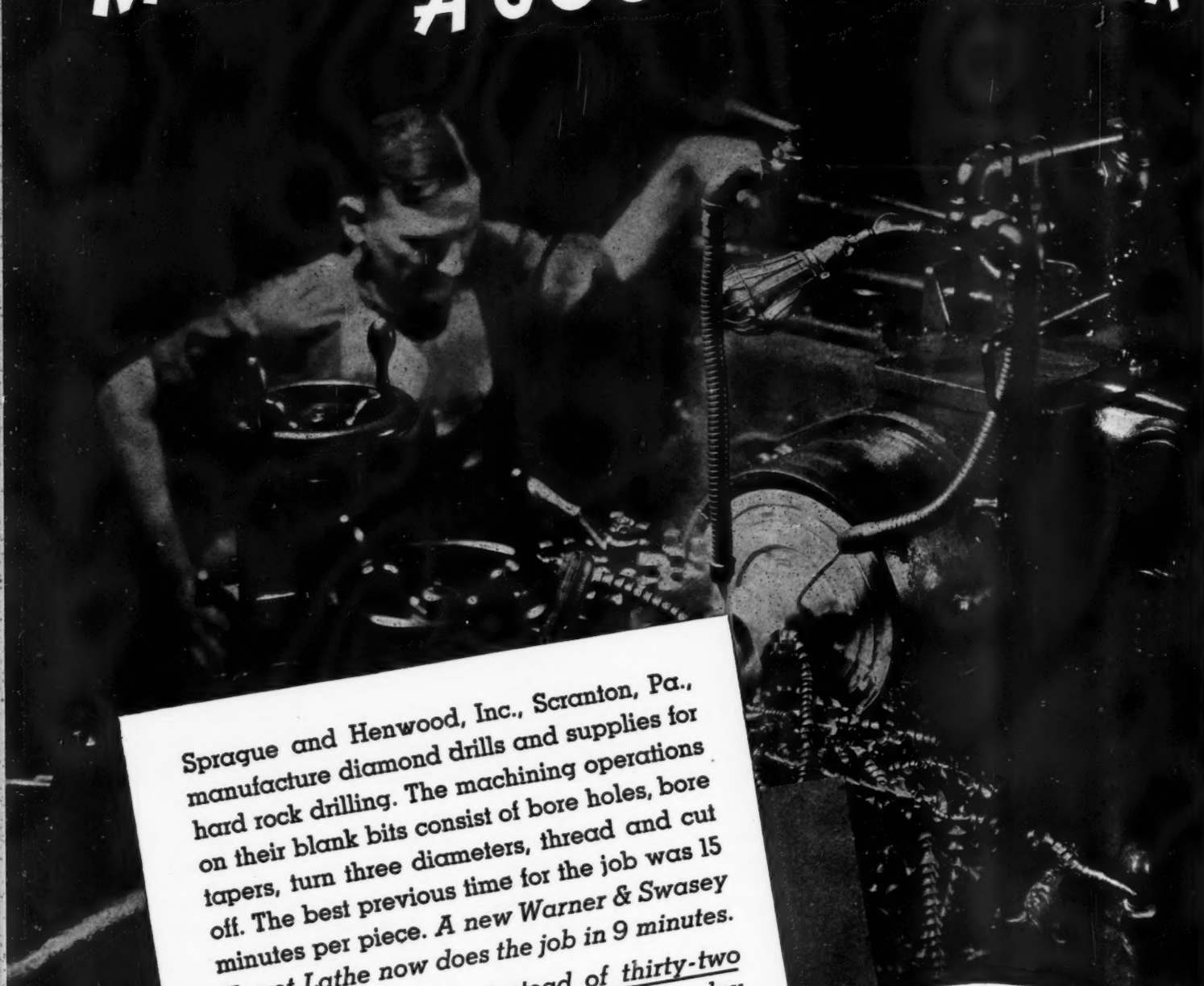
Next month the American Society of Tool Engineers, a lusty infant among the professional engineering societies, will hold a Machine and Tool Progress Exposition in Detroit. This will be on the occasion of the Society's first annual meeting. Our March 9 issue will be published on the opening day of the exposition, hence we have planned something special. Our editorial staff members have traveled extensively to gather data about the latest developments in the small tool field, and about other matters of interest to tool engineers.

There isn't the space here to pass along the details, but we should like to high-spot the editorial features. Boyar & Schultz operate a modern job shop at Chicago the methods of which are worth a close look. You will get it, along with a number of pertinent photographs. Several companies have thrown into the pot their experience with broaching tools and out of it has come an article of practical value to everyone concerned with broaching. You will see instructive pictures of set-ups for tool and cutter grinding which will give you ideas for your shop. A twist drill maker will go into the problem of scientific control of metallurgical processes in the manufacture of his products in an article "Stamina in Small Tools." Among the other subjects to be presented will be applications of electric gages, grinding fixtures, jig layout by microscope, carbide cutters, use of reamers, chip control and disposal (final article) and the drawing of steel shells.

In later issues

Our editorial staff men have been around the country a lot lately, digging into new developments in heat treating, welding, machining, stamping and other subjects of keen interest to production executives. This means that the issues of American Machinist this Spring will be full of information which will help you in the conduct of your business. Just to give you a hint of what is coming—one article soon will tell you how a well-known company has made appreciable savings by feeding sheet steel continuously into its stamping presses by a new method.

MAKING GOOD BITS A GOOD BIT FASTER



Sprague and Henwood, Inc., Scranton, Pa., manufacture diamond drills and supplies for hard rock drilling. The machining operations on their blank bits consist of bore holes, bore tapers, turn three diameters, thread and cut off. The best previous time for the job was 15 minutes per piece. *A new Warner & Swasey Turret Lathe now does the job in 9 minutes. Fifty-three drill bits instead of thirty-two at the end of an eight hour working day is a big step-up in profitable production.*

Another new No. 5 Universal Warner & Swasey Turret Lathe has just been installed on the strength of the performance of the first Warner & Swasey Warner & Swasey Turret Lathes may increase production just as profitably for your company. It costs nothing to find out, write

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WARNER & SWASEY

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Cleveland

AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

Millions for Defense

IN OUR SCHOOL days we read in our history books the thrilling ultimatum of a patriot who lived more than a hundred years ago—"Millions for defense, not one cent for tribute!" There were pirates in the Mediterranean then, as there are pirates now. But the pirates of that day were pikers compared to their modern successors. They operated as individuals, not as nations.

Today one might almost transform that old battle cry into one running something like this—"Millions for battleships, nothing much for arsenal and navy yard machinery." At any rate, when one analyzes the proposed appropriations one finds a wide discrepancy between the requirements for fighting units and those for equipment to build them and keep them operating.

In the old days equipment was not nearly so important a factor in national defense as it is today when whole nations are mobilized for industrial and economic warfare. Without casting any reflections on Army or Navy line officers or on members of Congress, we wonder whether they are sufficiently familiar with modern industrial processes to realize the extent of the change that has taken place, and the danger that lies in starving the manufacturing function of the defense mechanism.

As was pointed out in the article on educational munition orders by Assistant Secretary of War Johnson two weeks ago, the function of an arsenal is to develop the technique of munition manufacture. But how can it be expected to develop advanced methods if it has only obsolete machine tools at its disposal? The officials and the machinists are unusually ingenious, but ingenuity in adapting inadequate equipment is not at all what the occasion demands.

We urge as strongly as we know how that Congress face the situation that exists in government shops and yards, and that appropriations for equipment be in line with the importance of the needs there. The appropriations should be made available at once because it takes time for them to become transformed into actual machines. Government procurement processes are of necessity surrounded by checks and balances that slow them down. During the next two or three months many equipment building companies will be operating on reduced schedules, and would welcome additional orders. There would be a good chance that orders could be filled promptly.

SIX MONTHS from now the probabilities are that private buying will have recovered appreciably from its present low level. It is significant that one large manufacturer has issued orders that all vacations are to be taken this year before August 1. If government orders are delayed until summer the chances of prompt delivery are not nearly so good as they are now.

Gaging Business

THOUGH production in the metal-working industries has not visibly improved, sentiment has perked up a bit because of increased hopes for an upturn this spring. Domestic machine tool orders are hard to get, but inquiries are better. Export business, largely in connection with armament programs, is keeping some plants busy. Steel operations continue to hover around 30%, but a rise to 50% or better this spring is not unlikely. A more-than-seasonal increase in auto production from the recent low is now regarded as probable.

Farm implement makers are doing remarkably well and airplane builders even better. A government housing drive is expected to push apartment house construction this year up 50% above last year and to help private home construction to rise to the 1937 level. Already building is considerably better than sentiment in the trade indicates. Most industries will have reduced inventories to normal or sub-normal by April.

It is believed that curtailment of cotton acreage as an outgrowth of enactment of the administration's farm bill will have a favorable effect even outside cotton circles where prices will be directly stimulated. *Business Week's* business index is at 60.4 compared with 61.6 a week ago.

NEW ENGLAND—There has been a modest improvement in machinery orders. Electric utilities expect to make transmission extensions and are buying large power transformers Cotton textile mills report increased business, while inquiries in ventilating fan field are brisker. Pratt & Whitney aircraft has received a navy engine order totaling $1,730,000. Reciprocal tariff and tax revision uncertainties handicap sentiment.

ROCHESTER—Aside from auto parts makers, this district is active. One metal-working company is running day and night shifts, another is operating two shifts four days a week, a third is booked to capacity until August. Small tool and die shops are busy because customers are making plant adjustments and replacements during slack times. A large camera plant laid off 1,000 men Feb. first, this being the first marked curtailment locally.

PITTSBURGH—Though steel stays around 30%, industrial employment is near 50%. Rolling mill machinery builders are close to end of boom caused by new strip sheet and tin plate mill construction. Roll work, of course, is way down. Electric equipment makers, running all week, are at half force. Feeling that business will come back with a rush, a big company has ordered white collar workers to complete vacations by August first.

DETROIT—A few equipment orders for the Ford tractor have been released, but the bulk is yet to come. Ford's tractor production probably won't start in time to benefit from this year's market. The supply business is only a fraction of what it was several months ago. Toledo reports a slight improvement.

CHICAGO—Machinery sales are meager, but inquiries are more numerous. In contrast with low steel operations, implement makers are running at 75%. Railroad equipment purchases are almost non-existent. Employment is variously estimated at 50 to 75%. Bright spots: Stewart-Warner has added 1,000 employees since its January low and Chicago Molded Products will build a new plant.

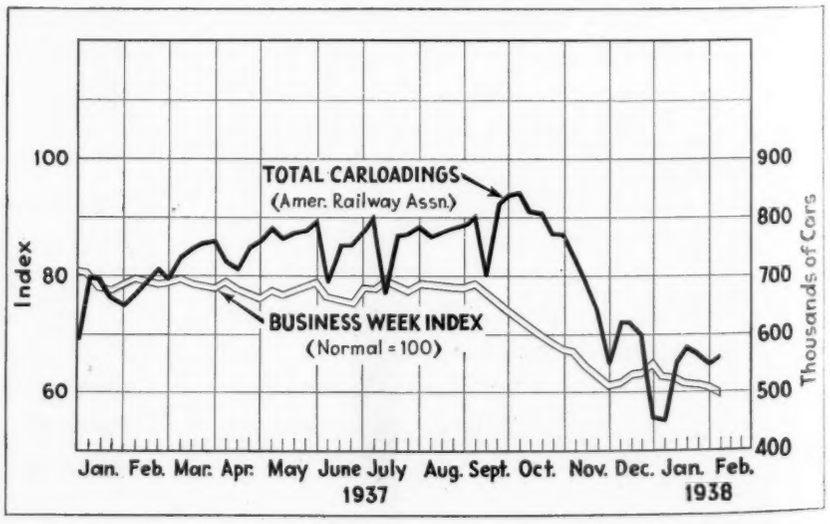
PHILADELPHIA—Business is quiet with few orders being placed and not many inquiries coming out. Government purchasing is helping a little. Shipyards are preparing for a rush of activities.

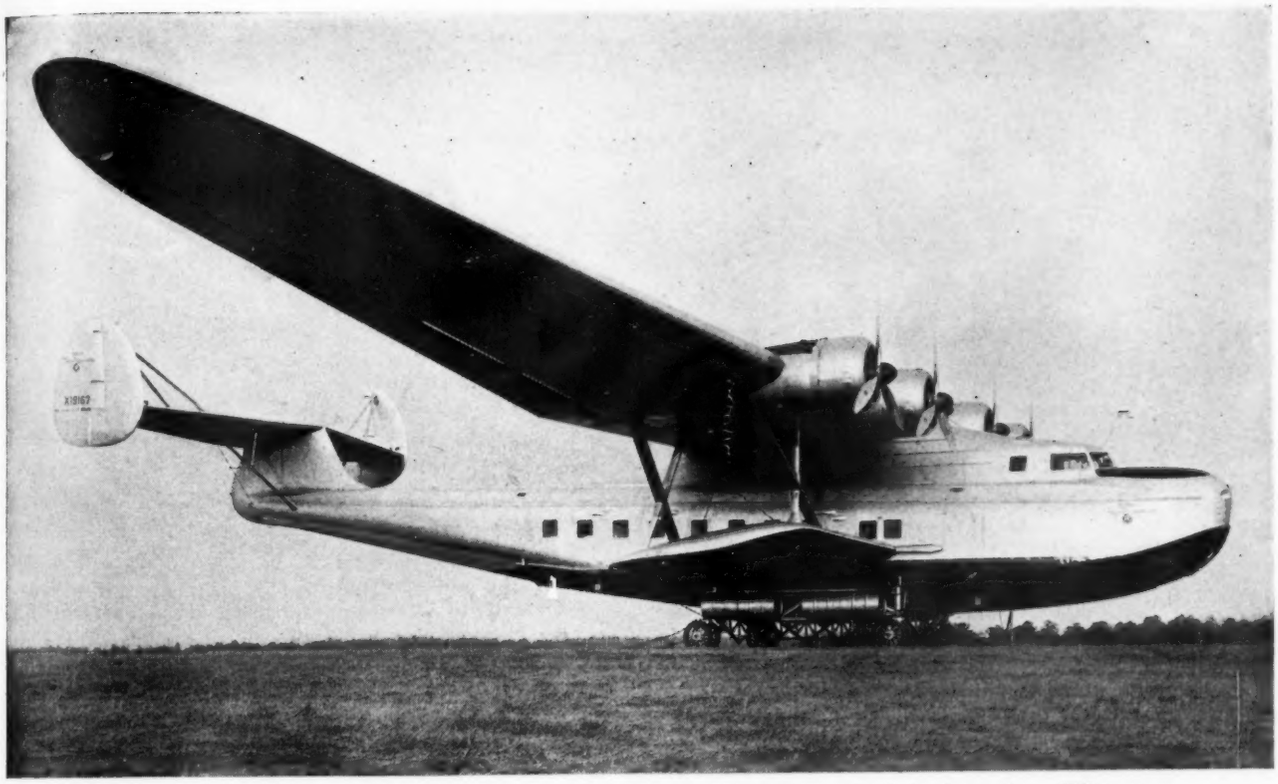
CINCINNATI — Conditions are spotty with some plants ata low level and others, thanks largely to foreign orders, doing well. Backlogs of most machinery builders, however, are pretty slim. Indianapolis machinery trade reports inquiries fair, orders hard to close, but manufacturers optimistic regarding a late spring upturn.

PACIFIC COAST — Machine tool sales are expected to be slow for some weeks. However 33 new factories have opened this year at Los Angeles and 29 others have expanded materially. Arizona construction is 19% ahead of last year with gold activity offsetting poor copper prices. Aided by capacity lumber operations retail sales in Washington state are 13% better than last year.

CARLOADINGS VS. GENERAL BUSINESS

Although general business continues its downward trend, carloadings show a slight upturn, continuing the rise which started the first week in January.



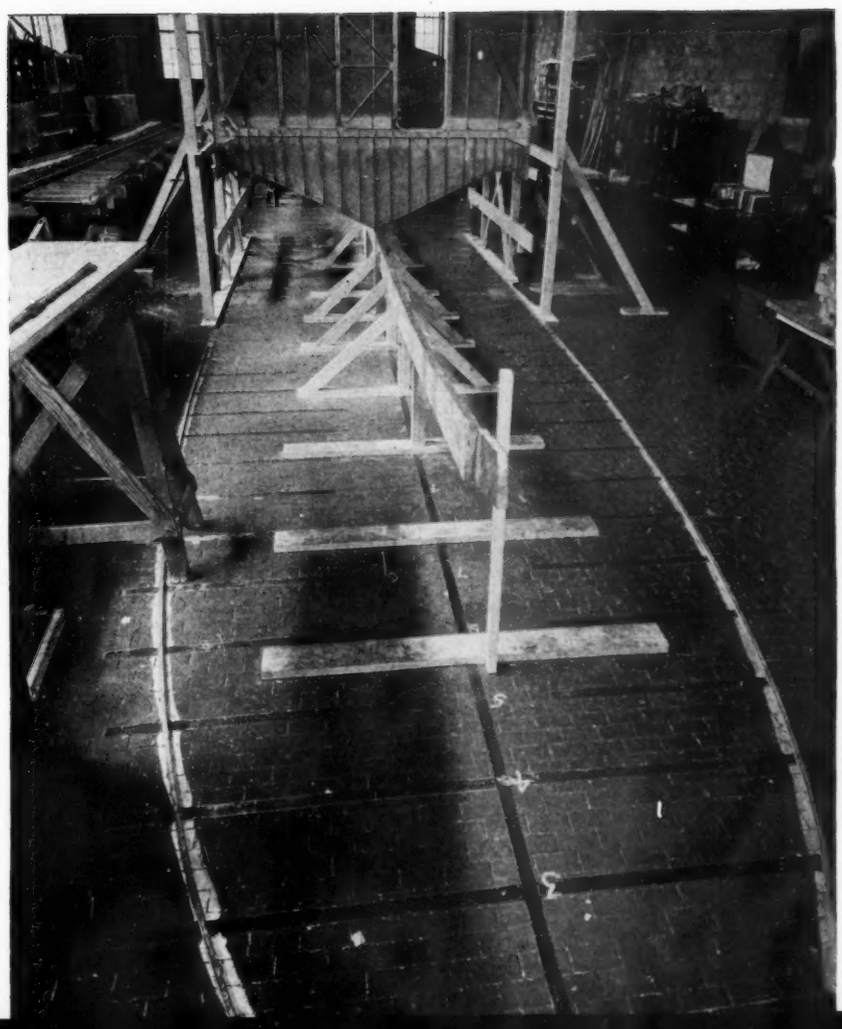


Finished and resting on its beaching gear, the "Martin Ocean Transport" reveals its huge size. Wing span is 157 ft.; over-all length, 91 ft. 10 in.; height on beaching gear, 27 ft., and weight, 63,000 lb.

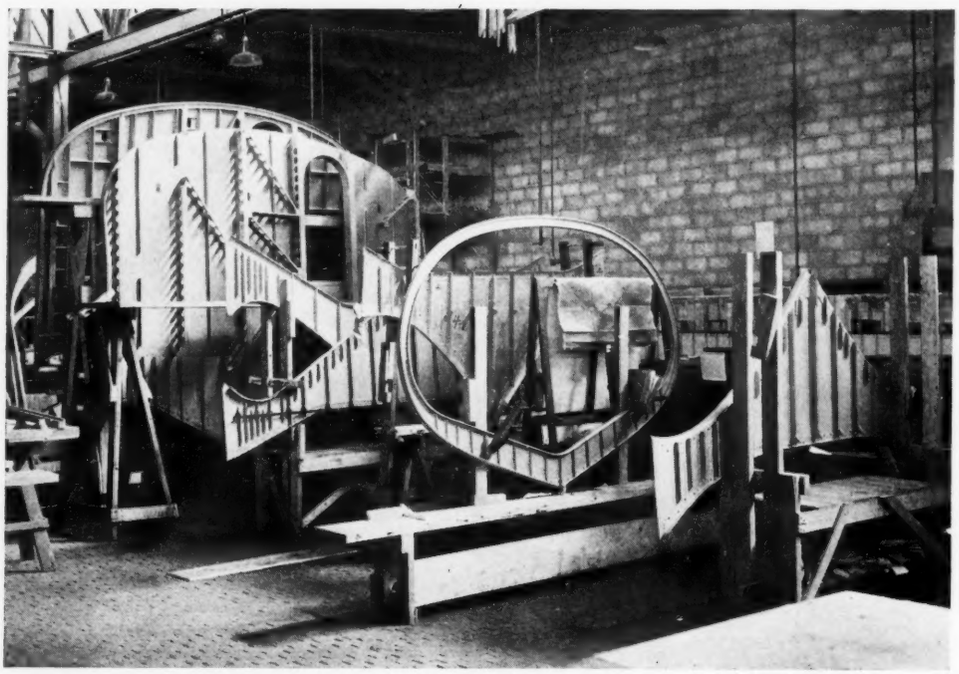
MARTIN BUILDS "OCEAN TRANSPORT"

ON JANUARY 20 the Glenn L. Martin Company flew the new four-engined "Martin Ocean Transport" from Baltimore to New York for dismantling and shipment overseas. This flying boat, the largest ever constructed in the United States, will carry 46 passengers, mail and cargo for 5,000 still-air miles, and is the first ocean air liner capable of non-stop commercial transport from New York to London.

Construction of the Model 156, which is far larger than the China Clipper, was undertaken in shop space set aside from that used in production of the company's bombers. Although custom-made, this ship was fabricated by the same methods used in the regular production procedure. Except for engine mounts and high-stress points, the entire aircraft is constructed of Alclad.



Months of work were required to fabricate and assemble the thousands of parts needed in the largest flying boat ever built in America. The hull assembly jig is shown in course of erection

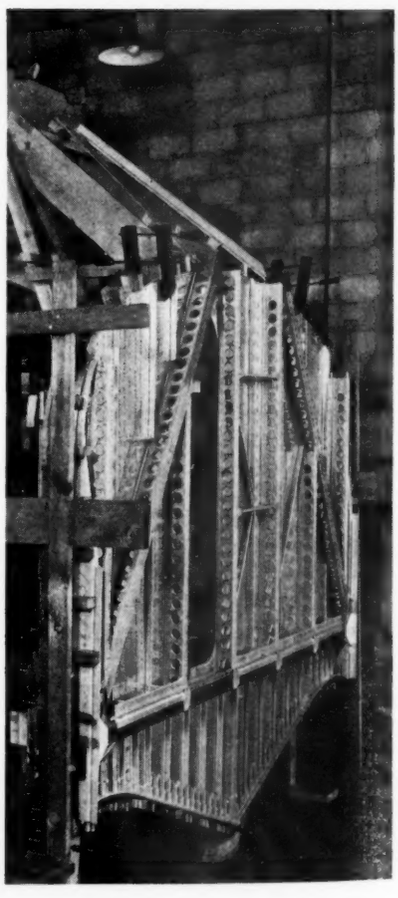


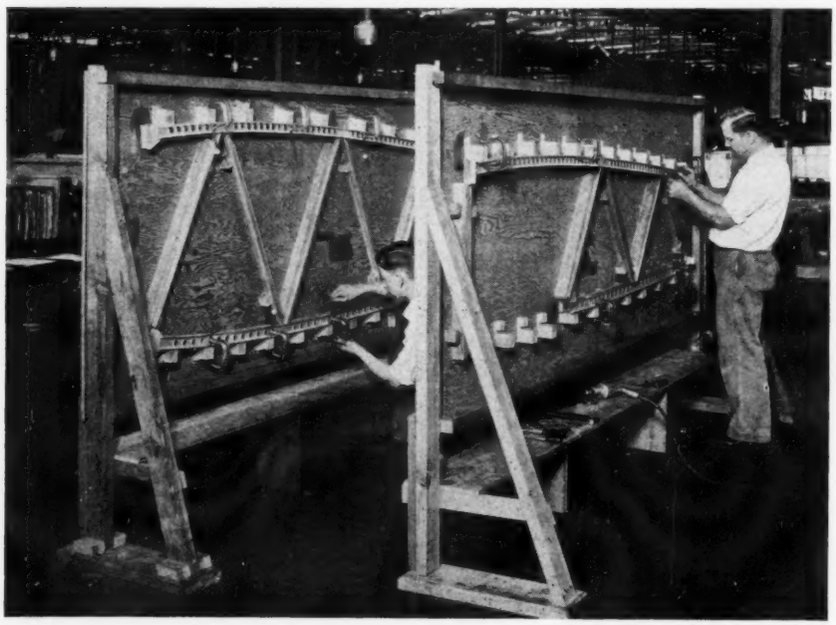
Numerous frames and bulkheads, each different from the others, had to be assembled and riveted prior to installation at the proper cross-sections in the hull

Wooden assembly fixtures were made up in the pattern shop so that each of the frames and bulkheads would be in exact alignment and thus fit readily in the hull

Because of the huge size of the hull—91 ft. 10 in. long over-all and 11 ft. 3 in. beam—the keel line was laid out on the floor and above it the assembly jig constructed. Bulkheads and stiffening frames were assembled in fixtures and then placed in the keel jig. Each of the bulkheads and frames is different from the others because of the constantly changing cross-section of the ship. There are three compartments for passengers, a sixteen-passenger luxury lounge, cargo holds, crew quarters, flight control deck and navigation room. All of these are separated by watertight bulkheads.

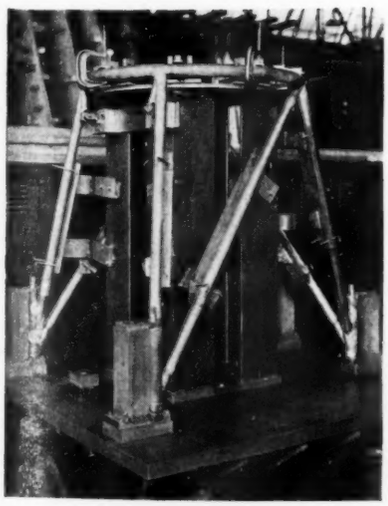
The huge main wings, the stubby sea wings (these carry 4,260 gal. of fuel and contribute lift and stability) and the tail surfaces were fabricated in the regular production departments. All major components were then taken outside for assembly. At that time the huge new assembly hall which will accommodate several aircraft of the size of the Model 156 was not then finished. The wings were hoisted into position and connected to the short center section spanning the hull. Tail surfaces, motors and numerous fittings were then installed. On Nov. 22 the Ocean Transport was wheeled on its beaching gear to the Chesapeake Bay and launched.





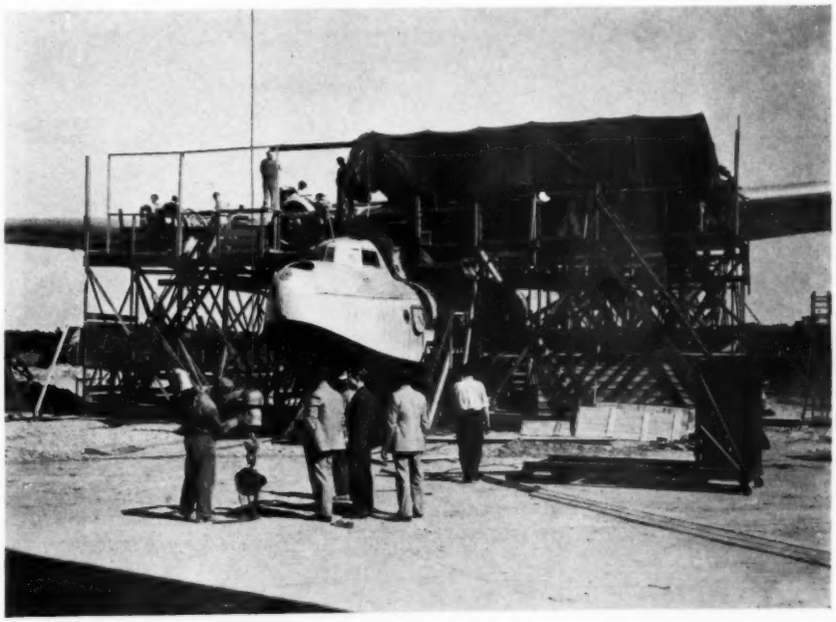
An over-all wing span of 157 ft. required numerous wing ribs of differing cross-sections. These ribs are being assembled here for riveting

Skilled assemblers are placing the longitudinal members that connect the bulkheads and frames installed in hull jig. The corrugated hull bottom, already in place, gives stiffness to the structure, and a corrugated deck covering will soon be applied



Four engine mounts such as this one were welded on a built-up welded assembly fixture

Engines, wings and tail surfaces are in place, and final adjustments are being made. Lack of a suitable hanger during assembly of the Model 156 made it necessary to do this work in the open



Clutch Making at Inland

New type of flattening furnace, special tooling and elaborate conveyor system feature new plant

C. P. NELLIS
Factory Manager, Inland Manufacturing Division
General Motors Corporation

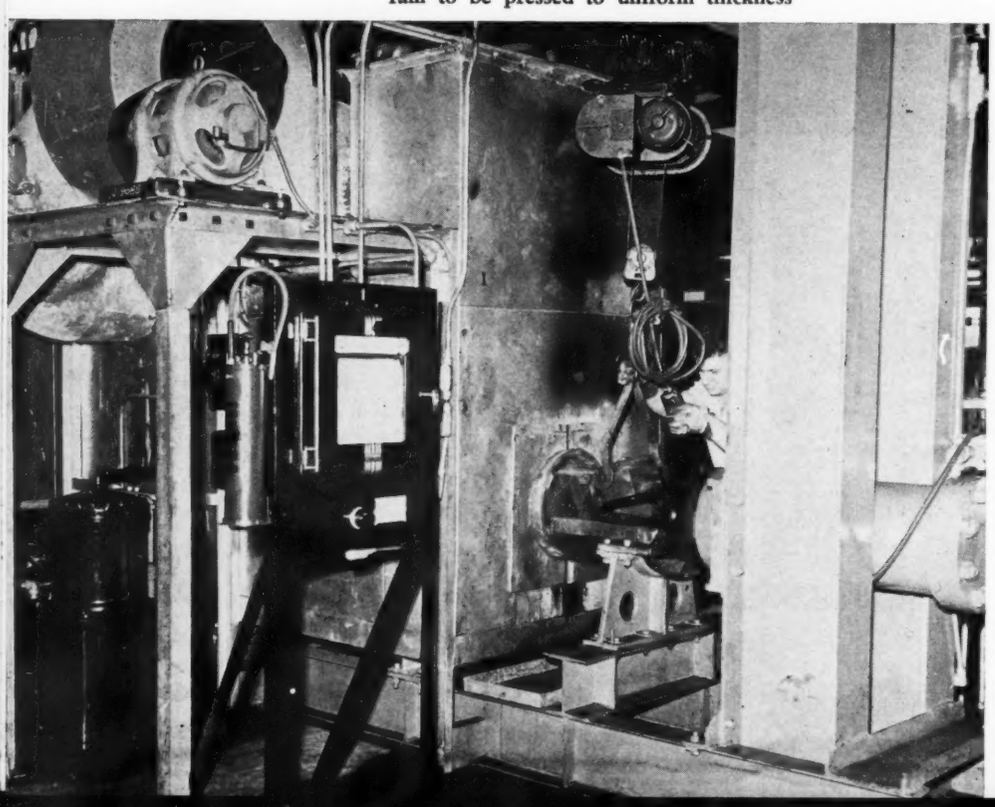
A NEW AUTOMOTIVE clutch which reduces driving effort and increases the driver's control over his car is now being produced in large quantities by the Inland Manufacturing Division of General Motors Corporation. This clutch is being used on some 1938 models and will be adopted more extensively before the present year is out.

For the manufacture of the clutch, Inland erected a new building at Dayton, Ohio, and completely equipped it with new machine tools, heat-treating furnaces and testing apparatus. A feature of the plant is the elaborate conveyor system which carries parts to and from operators at convenient working heights. Probably the most interesting equipment is that for heat-treating, particularly the flattening furnace for pressing disks under hydraulic pressure to a uniform thickness, and the controlled atmosphere furnace in which disks are hardened.

The new Inland clutch operates on a principle which has had some applications in long-range artillery, hydraulic presses, rail-car couplings, and similar heavy-duty installations. However, it has never before been used in the automotive field. The central unit is a spring diaphragm of heavy heat-treated steel shaped something like a concave disk, or more accurately a "dished" washer with eighteen tapering steel fingers pointing inward from its edge.

When the clutch is in the engaged position, the entire outer rim of the disk bears against the pressure plate providing complete distribution of the driving load. When the pedal is depressed for disengagement, the pressure of the throw-out bearing on the inner ends of the fingers causes a diaphragm action, comparable with that which takes place when the bottom of an oil can is pressed. The outer ends of the fingers, toward the rim of the disk, pivot on the foremost of two fulcrum rings, one of which is located on either side of the diaphragm. This causes the rim of the diaphragm to spring away from the friction disk against which its own stiffness has held it, and disengagement results.

Steel disks in hydraulic fixture are fed into flattening furnace by hydraulic ram to be pressed to uniform thickness



Just as the initial pressure required to operate an oil can is greater than that needed to complete its depression, so does the pressure required by the new clutch decrease as the pedal stroke progresses. At the same time, engagement characteristics have been greatly improved. The fact that the entire rim of the diaphragm bears on the pressure plate assures complete distribution of the driving load. Because the disk pivots on the fulcrums provided by the two steel rings, friction is held at a minimum, not only when the car is new but also after long service when the conventional clutch develops noticeable friction drag.

There are four major parts which make up the clutch—the spring, the cover, the pressure plate and the pivot ring. Manufacture of each part will be described in the order named.

The clutch spring is made of General Motors 1080 strip steel 0.114 in. thick. The first important operation is to blank and pierce the center hole on a No. 59 Toledo press, the scrap being pushed out the back of the press and broken up by scrap cutters. The disk is then placed on a double-width roller conveyor which serves as a bank ahead of the flattening furnace.

Strip steel as it is rolled varies slightly in thickness across its width. It is essential in manufactur-

ing disks for the new clutch that the thickness be held to unusually close and uniform tolerance. For this reason it is necessary to machine the strips to close tolerance or to secure uniform thickness by some other means.

Inland has adopted the practice of putting the disks through a flattening furnace, thus heating and pressing them into proper shape. This furnace has a capacity of 125 disks per hour, each disk weighing 2 lb. Thirty disks are loaded in a hydraulic fixture which is placed at the loading end of the furnace by hoist and fed into the furnace by a 10-in. hydraulic ram. At the discharge end is a 10½ in. holding ram. Periodically the pusher ram applies a pressure of 650 lb. per sq. in. against the work in the furnace. While a single batch of disks is in the furnace, the pressure is exerted 36 times, each time for 15 min.

The furnace takes slightly more than four fixtures per hour. The work goes through a heating cycle of 6.2 hr. in the heating zone and 2.6 hr. in the cooling zone to produce the desired metallurgical requirements. Temperature does not vary more than 10 deg. The furnace is heated by convection through use of a standard air heater equipped with a low-pressure burner operating on 1,000 b.t.u. natural gas at 4 to 6 in. water pressure, and air at 1 lb. pressure. The heat is carried to and from the furnace by means of suitable alloy ducts. The air heater is equipped with safety controls which protect it against failure of air, gas or power supply.

The treatment which disks receive in this furnace is, in effect, similar to a low anneal and has several important results. It tends to reduce mill hardness and relieves strains in the steel set up in preceding press operations. It straightens up the disk for grinding and has a normalizing effect which makes the work easier to machine. This is noticeable in the prolonged tool life.

After emerging from the furnaces, disks go through two hand operations and then a number of drilling operations on a three-station vertical Natco drilling machine with an indexing head. The first Natco operation is to drill nine holes and the center hole, the second to drill the other nine holes and ream the center hole, and the third to ream the eighteen holes which were drilled during the first two operations.

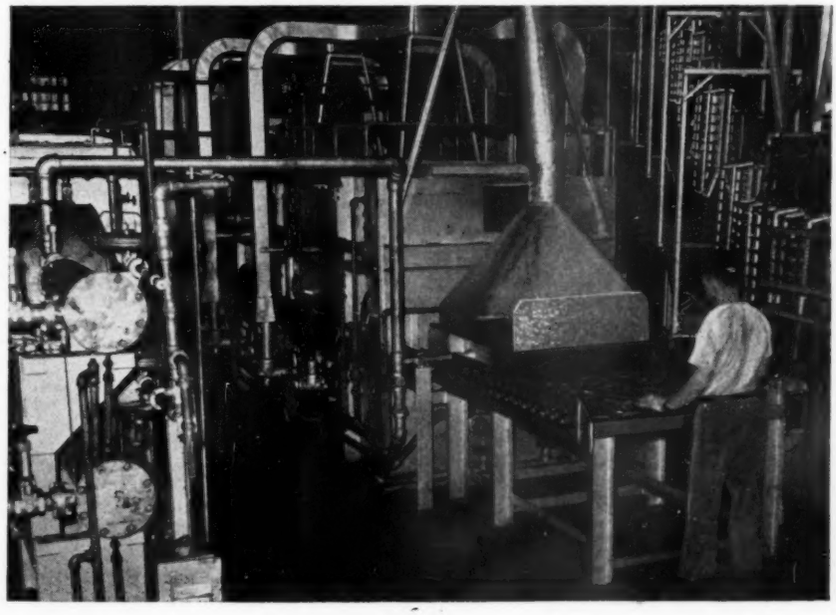
From the Natco, disks move to

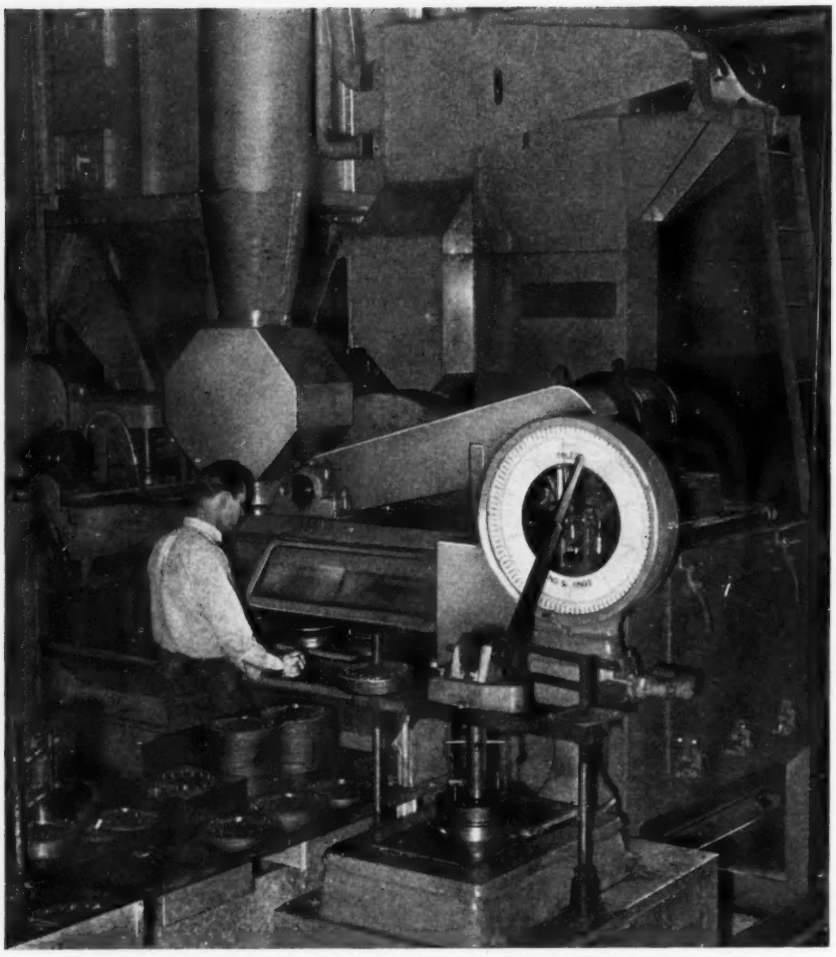
Both sides of disks are ground to size on rotary Hanchett grinder with three heads and six chucks. Table speed is 2 r.p.m.

Gardner grinders to have the stock thickness rough ground down to within 0.002 in. of finished grinding dimension. Both sides of the disks are ground to size on a vertical rotary Hanchett grinder containing three heads and six chucks. The heads are automatically set to a predetermined point which governs the thickness of the finished product, the limit of which is 0.002 in. Every other chuck on the machine is 0.0015 in. higher than the preceding two chucks. The first operation on the lowest chuck removes 0.0015 in. of stock. After a disk has made a complete circuit of the machine, it is transferred by hand to the next higher chuck, the table speed of the machine being about 2 r.p.m. The magnetic chucks in the loading and unloading positions are automatically demagnetized. The cone of the disk spring is formed on a No. 59 Toledo press and eighteen holes are slotted, nine at a time, in a similar machine.

Since disks are made of high car-

Disks are hardened in controlled atmosphere furnace of gas-fired radiant tube type using prepared atmosphere of C.G. gas





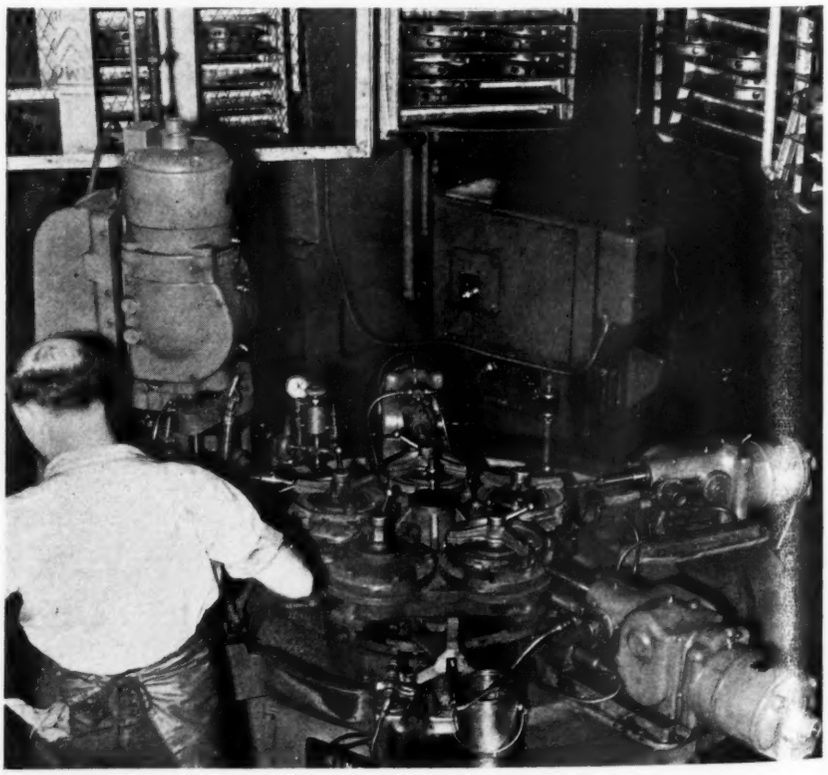
Clutch springs are given shot-blast treatment in a Wheelabrator

bon steel to secure the necessary springiness, they are hardened in a controlled atmosphere furnace to prevent scaling and decarburization. This furnace is of the gas-fired radiant-tube type utilizing a prepared atmosphere of C.G. gas. The work moves through the furnace on an alloy steel mesh belt which travels over alloy steel rollers driven by sprockets outside the furnace. The radiant tubes are arranged above and below the conveyor belt. Heating elements are shaped like the letter "W" with the exception of the elements around the quench chutes which are made in a hairpin shape. Inlet end of the tube has a special combination pre-mix and diffusion type burner. Outlet end has an eductor which causes a positive movement of the flame and gases produced in the heating elements toward the outlet end. The eductors are operated by air under pressure supplied by a blower. It is also the function of the eductors to inspirate the required amount of gas from the atmosphere to the burners located at the inlet end of each radiant tube.

For the purpose of producing clean work, an atmosphere gas preparation unit is used with the furnace. Known as a C.G. unit, it consists of a chamber fired on both sides by low-pressure burners, each chamber housing alloy cracking tubes. This unit requires about 300 cu. ft. of natural gas per hour to heat the cracking tubes. Also 200 cu. ft. of gas per hour is employed in the cracking tubes to generate the C.G. atmosphere gas. In connection with the furnace a Brown Analy-Graph is used to analyze continuously the furnace atmosphere. It immediately records any fluctuation in the composition of furnace gas. The furnace is over 27 ft. long with work passing from one end to the other in 20 min. Temperature at the loading end is 1,300 F., in the center heating zone 1,440 F., and at the unloading end, 1,480 F. Production is 120 disks per hour.

At the end of the furnace, the disks are dumped automatically into an oil quench tank having an oil seal and thence are cleaned as the conveyor line moves through a Rex degreasing machine. The quenching oil conforms to General Motors S-9 specifications and is maintained at a temperature of 110 F. Disks travel in the quenching oil 42 in. and are removed by means of a variable-speed conveyor. The speed is set to remove springs separately, thus elim-

Pressure plate holes are drilled, countersunk and tapped on five-station Kingsbury machine. Note the overhead parts conveyor



inating interference in the quenching medium.

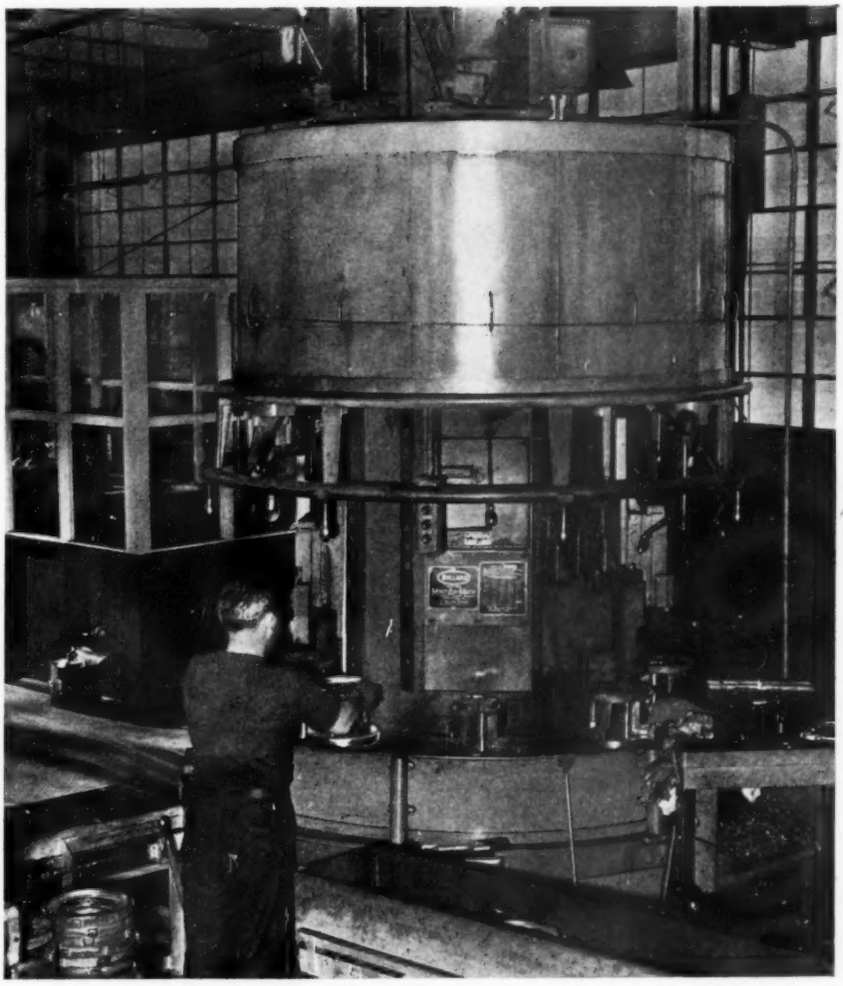
After cleaning, disks are removed from the conveyor by hand and placed on a special rack-type conveyor for passage through an air-draw furnace for a preliminary draw to relieve some of the hardening stresses. The furnace cycle is 1 hr. at 800 F. Work is fed through on a special conveyor containing 62 disks in each fixture.

The final draw and heat set on the disks (or clutch springs, as they are called) are given in a furnace heated by a convection air heater. The furnace cycle is 6 hr. at 965 F. Four fixtures, each containing 30 disks, go through the furnace each hour. General design of this furnace is similar to that of the heat flattening furnace.

Clutch springs are tested for hardness on a Gogan hardness testing machine, after which eighteen holes are produced on a special Natco machine. The work then is placed in a Wheelabrator for shot-blast treatment. The results of the Wheelabrator action are similar to a cold working process in that a certain load characteristic is acquired. Work is thoroughly inspected prior to and following assembly.

Clutch covers are made of General Motors 1010 steel. The steel is blanked and drawn in a Toledo press, six pieces being secured from each strip of steel. The work then passes through a number of stamping operations; a restrike and embossing, piercing and trimming, piercing three rectangular holes in the top, piercing vent holes and lug holes, and flanging the inside diameter and flattening. In connection with each press the scrap is pushed out the rear and dumped by hand into a nearby chute which delivers the material into buckets on a trolley conveyor. These trolley conveyors have fixtures with a number of shelves. As the work moves from the first operation to the second, the press operator places it on the first shelf; when it goes from the second to the third, he puts it on the second shelf. By the time the work reaches the last operator it has been carried on all eight shelves.

A simple but effective means is used to make sure that the operator takes the work from the right shelf. Between him and the conveyor is a steel screen. There is an opening in the screen at the level of the shelf from which he is to take the work for the operation on his machine. The other shelves are not within his reach. Every fifth conveyor fixture with shelves has hung from the bottom shelf a bucket which is used to carry away the steel scrap from the presses.



Radius and O.D. of pressure plates are faced and turned on Bullard Mult-Au-Matic which has six chucks and loading station

After stamping operations are finished, the clutch cover goes to Sundstrand lathes where the flange bosses and the pivot ring seats are faced. These lathes are equipped with automatic air chucks. A number of operations follow—the reaming of 24 holes on a Natco machine, broaching three lug holes for the pressure plate on a three-way Colonial broaching machine, cleaning by passage through a degreaser, and assembly with the spring on a special conveyor.

Pressure plates are made of low nickel-chrome iron with combined carbon of 0.65 per cent and with Brinell hardness of 207 to 229. When castings come into the plant, they are checked on a Gogan hardness machine and immediately pass to a Bullard Mult-Au-Matic which faces and turns the radius and the O.D. The machine has special tooling consisting of six chucks and a loading station where two pieces may be loaded simultaneously. Pressure plates then are ground on a Heald machine, three drive lugs are broached on a vertical Colonial broach, and drilling, countersinking and tapping are done on a five-station Kingsbury automatic machine with a milling head. The work is polished on a special polishing machine and balanced on a static balancing machine of General Motors design. After being inspected with functional gages, pressure plates are assembled to the spring and cover assembly.

Pivot rings are fabricated from S.A.E. 1015 coiled wire. The rings are formed on a Stetcher ring machine, and the ends are welded together on a special Federal butt welder. The wire tolerance is 0.0015 in.; the ring must be flat to within 0.002 in. with a 200 lb. headload. Rings are sized, embossed and the flash trimmed on a Toledo press. Following gage inspection, pivot rings are assembled to the spring and cover assembly.

Current Practice in Chip Control

II—Safety of the operator and economical use of cutting material are of primary importance in determining what method of chip control is to be used

CHIP CONTROL and disposal problems occur most frequently in connection with turning operations, particularly where cutting is continuous on high-alloy steel parts. This symposium, of which this is the second of three sections, reports on the present practices and recommendations of nine companies who have had considerable experience with operations of this nature. Proper control of chips can be secured only after careful analysis of all of the factors involved.

When applying chip breakers, it is important to consider the need for keeping the chips away from finished surfaces, since they may cause damage. This is not a serious problem in many instances, and it is often possible to cause the chip to turn back into the work and break it short. Other conditions will, however, require that the chip be turned away from the work and broken against a portion of the tool or some section of the machine.

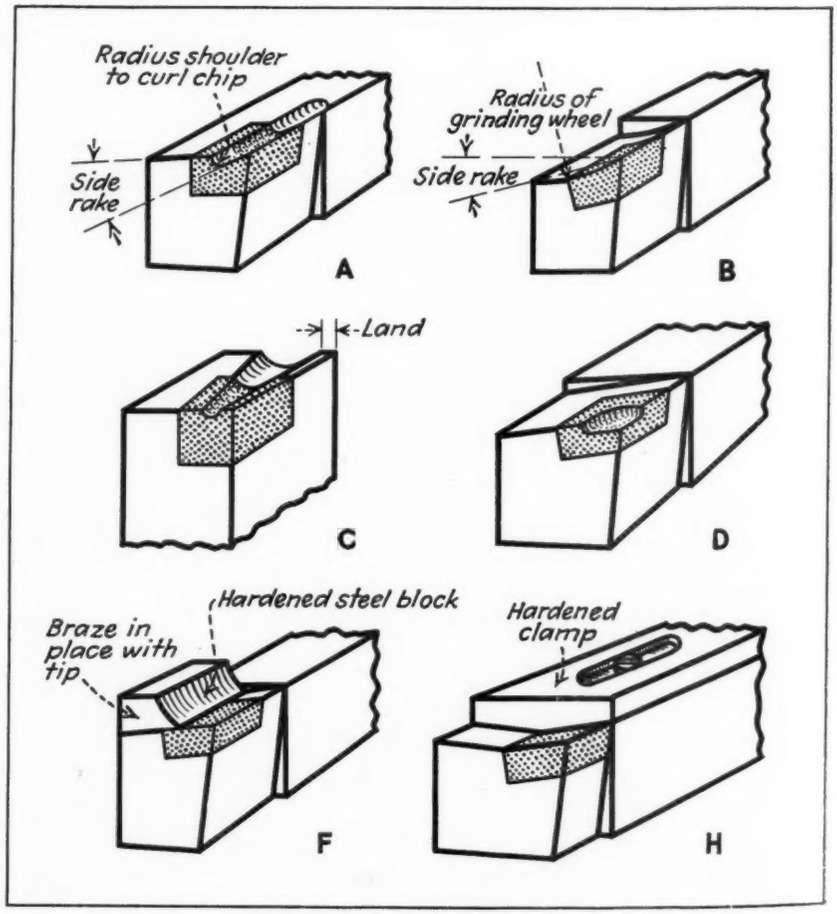
In the old days a strip of steel was often clamped to the tool holder in order to deflect and break the chip. The operator would stand nearby with a wrench in his hand and break off any chips that did not strike the breaker. Turning speeds, in those days, were relatively slow and this could be done with safety. Present-day cutting speeds make this impractical, if not impossible. Care is required for best results.

MALCOLM F. JUDKINS
Chief Engineer
Firth-Sterling Steel Company

Chip curlers are most important when cutting steel. In rough turning, a long, hot, straight chip becomes a serious safety problem. In multiple cutting and in automatic machines, chip interference is likewise a perplexing problem. We, however, advise caution in the application and use of chip breakers. It is recognized that any device which appreciably impedes chip flow and chip removal from the region of the cutting point of a tool may be a source of real trouble in the form of poor finish or even tool breakage, if the greatest care is not observed. Chip disposal is one of the most important factors affecting both single-point and fluted tool designs.

In the accompanying illustration, Fig. 8, are shown popular types of chip breakers and curlers which have been employed with Firthite-tipped tools. Of these, the styles shown at

Fig. 8—These chip breakers and curlers have been successfully employed with Firthite-tipped tools. Each variation has been developed for a particular application



A and *D* have proved the most effective in curling and breaking chips. The style shown at *A* is suitable for single-point turning, where the chip may be permitted to escape in the form of a long helix, either through frame openings in the chip pan or over the apron and thence to the floor. The style shown at *D*, wherein the chip breaker is ground at an angle, tends to throw the chip back upon the work and break it short. This style is preferable for tools used in automatic machines.

The curler shown at *B* merely curls the chip without directly breaking it, while that shown at *C* indicates the method of adapting the chip curler to a vertical, or box tool. A variation of the chip breaker is shown at *F*. In this style, the breaker takes the form of a piece of hardened steel brazed over the chip. This eliminates grinding away valuable tip material. When the Firthite tip is mechanically held, the chip breaker shown at *H* has proven successful. An adjustable, hardened clamp is used here to curl the chip.

THE AMERICAN TOOL WORKS COMPANY

Our experience in this field has been confined to the comparatively narrow range of lathe roughing and finishing operations when turning steel bars held between centers. The development of our standard chip breakers goes back about seven years, when we began a series of experiments to determine the possibilities of cemented-carbide tipped tools for roughing steel. We soon learned that the crux of the problem was the element of operator safety. With a properly ground tool, the chip hazard, even at a 200-ft. per min. cutting speed, was such as to preclude operative control without considerable danger.

The problem, obviously, was to first curl the chip and then to break it into short lengths. If the tool were correctly ground to promote proper life to the cutting edge, a chip without appreciable curl was produced. If, on the other hand, the tool was ground so as to produce a curled chip the cutting edge and often the tool itself was quickly destroyed. It soon became evident that some auxiliary device was essential to give the desired results. During our experiments almost every conceivable shape of breaker, together with various materials and heat-treatments of the same, were employed.

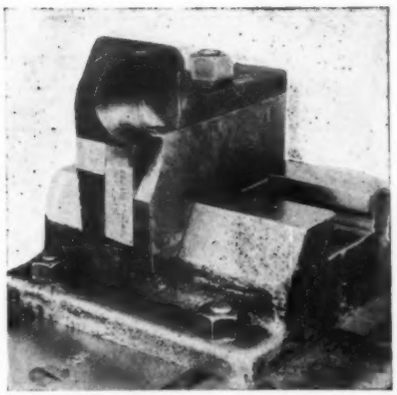


Fig. 10—Vertical tool-holder and chip breaker recommended by the American Tool Works Company for severe turning operations. This design is claimed to give a rigid set-up

The chip breaker developed as a result of these experiments is shown in Fig. 9. This patented breaker permits satisfactorily uniform results with maximum tool life over a wide range of turning conditions. Results accomplished are obtained by a combination of conical and cylindrical surfaces which curl the chip and then break it into short pieces. These pieces are, in turn, deflected downward into the chip pan. The breaker also tends to concentrate the coolant stream on the cutting edge of the tool and on the work.

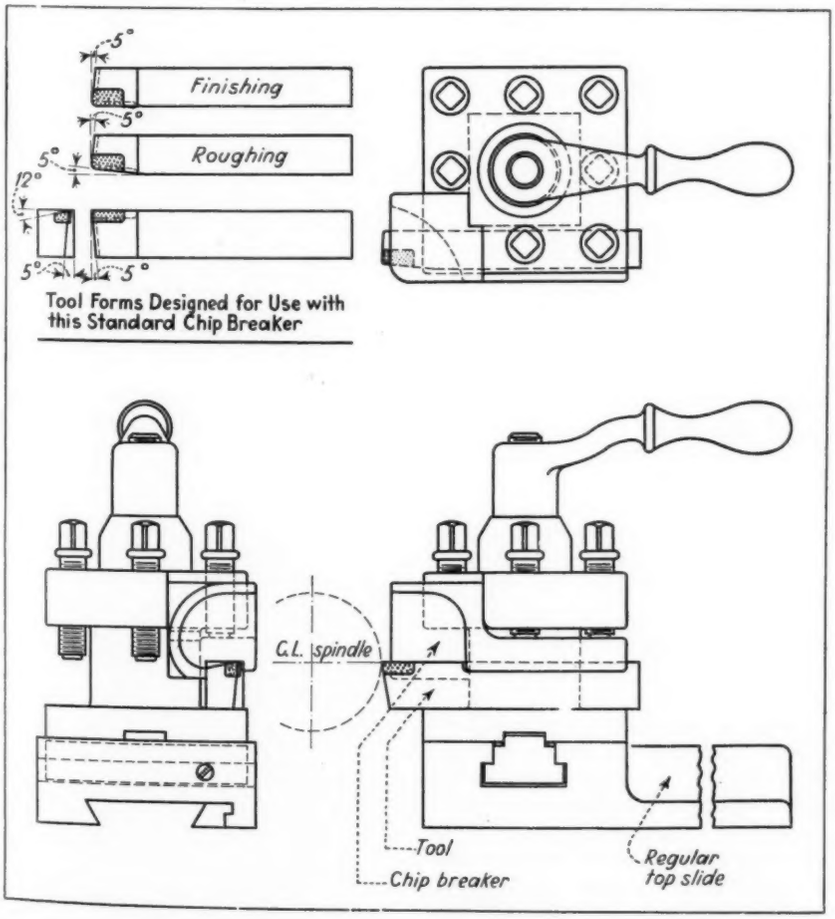
Breaker Closely Fitted

In order to insure proper setting of the breaker in relation to the cutting edge of the tool and to provide a rigid mounting, the breaker body is closely fitted over the top and sides of the tool shank. Each size of tool requires a different breaker. A breaker having a hood similar to that shown in Fig. 9, but providing for vertical mounting of the tool shank, has been developed for more severe turning operations. Such a breaker is shown in Fig. 10.

When roughing bar stock and rough forgings, this chip breaker permits the use of cuts up to ½ in. deep at speeds ranging from 200 to 350 ft. per min. and feeds ranging from 0.020 to 0.030 in. per rev. Occasionally we use both coarser and finer feeds, but the above range covers average requirements.

Correct combinations of speed,

Fig. 9—Tools used with the chip breakers recommended by the American Tool Works Company for lathe roughing operations function best when ground as shown. The breaker is shown here assembled with a tool in a four-way tool block that has been machined to give clearance for the hood



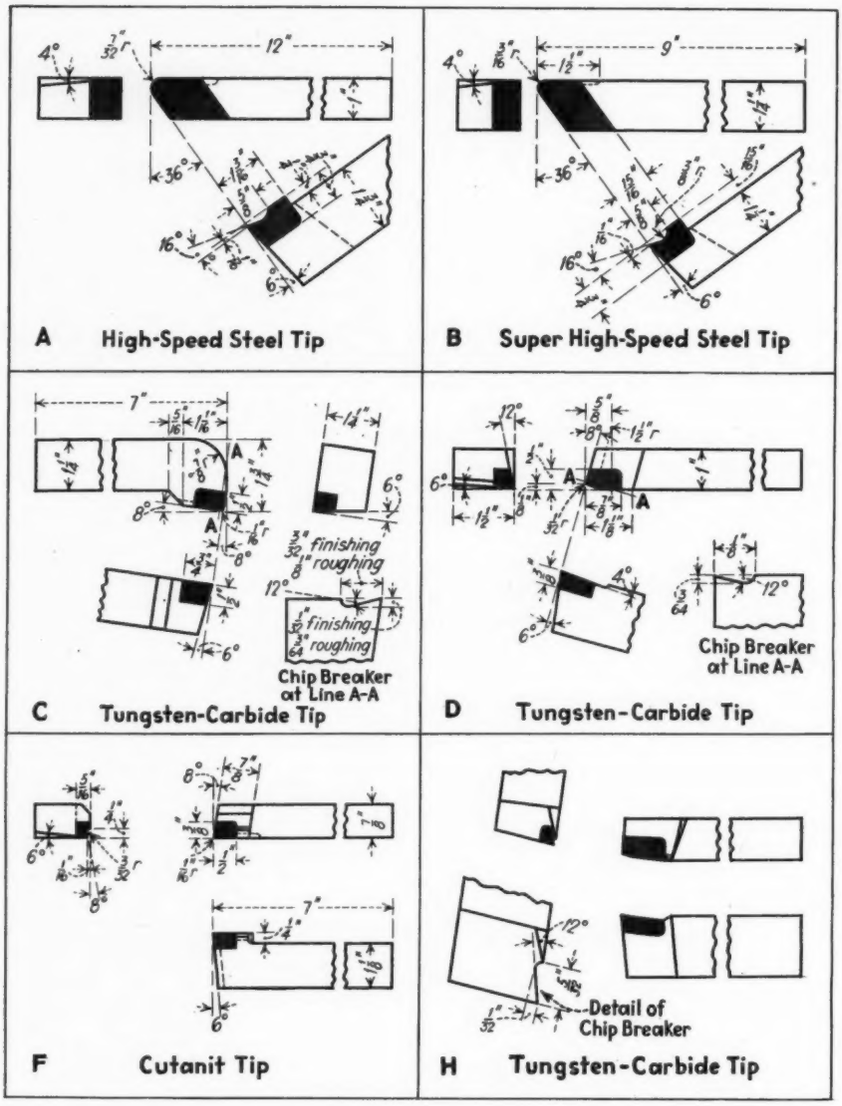


Fig. 11—Each combination of cutting tool type, material and machining speeds requires a slightly different chip-breaker groove. The grooves shown are those used by Westinghouse for applications indicated in the text and have been applied only after a careful analysis of the work to be done

feed and depth of cut varies considerably with the material being turned. For example, a cutting speed of 350 ft. per min. may be used on SAE 1045 bar stock, while SAE 4145 rough forgings require cutting speeds as low as 200 ft. per min. to produce best results.

E. E. GRIFFITHS
Director, Time Study and Methods
Westinghouse Electric & Manufacturing Company
East Pittsburgh Works

We have found that each type and style of cutting tool, as well as the material to be machined, requires separate consideration when determining the type of chip breaker to be used. We have been experimenting to develop chip breaker grooves for high-speed-steel, Stellite and tungsten-carbide tipped tools for machining steels of all types.

When turning with a tool ground with a flat top and no lip or chip breaker, chips will flow in a straight ribbon. Straight chips, as well as those having curls of a larger radius, are difficult to handle and are dangerous to the operator. In some instances we have had tools break when the chip tightened around the tool and holder.

Our practice is to grind a small groove in the face of the tool, near the cutting edge. This so-called chip breaker will curl the chips into a tight spiral, breaking them into short sections. If the groves are made too deep or too wide, and without a radius developed from the cutting angle, the chips are usually formless. These grooves frequently cause the tools to spall and the high pressure exerted by the chips often causes the cutting edges to break. However, groves adopted as standard usually meet most requirements. Experiments with chip breakers made of an additional piece, brazed or clamped on the top of the tool, have not shown satisfactory results.

Standard Tools

For tools tipped with high-speed steel and super high-speed steel, the chip breakers shown at *A* and *B*, Fig. 11, have proven most satisfactory for cutting axle steels. The tip dimensions shown at *A* are for tools tipped with high-speed steel while those shown at *B* are suitable for tips of super-high-speed steel on a mild steel shank.

The tool shown at *C* is tipped with tungsten-carbide and the dimensions are for the chip breaker developed for use with extremely tough, but soft, forged steel rings of the 40 to 50 carbon type material when heat-treated to 285-300 Brinell. For chrome-vanadium steel shafts, our practice is to grind a tungsten-carbide tipped tool as shown at *D*.

Dimensions of a chip breaker that has proven satisfactory when used with a "Cutanit"-tipped tool used for machining mild steel shafts and rings is shown at *F*. Here the groove dimensions are somewhat different from those shown in the previous examples. Another breaker groove suitable for this service is shown at *H*.

An example of the results accomplished through the proper selection of a chip breaker lies in the machining of large commutator rings of 0.60-0.75 carbon and 0.60-0.85 manganese steel having a Brinell hardness of 245-255. One size of these rings averages 24-in rough diameter and is rough turned at 175 surface ft. per min. in a 36-in. side-head boring mill. Roughing is done with a 0.018-in. feed, and a $\frac{5}{16}$ to $\frac{3}{8}$ in. depth of cut. When a tungsten-carbide tipped tool having a proper chip-breaker groove is used, finish turning can be accomplished at 350 to 400 surface ft. per min. with a 0.011-in. feed and a 0.045-in. depth of cut and the finish obtained is such as to permit polishing the entire surface with fine emery cloth in $\frac{1}{2}$ hr. When these rings were rough and finish turned with high-speed steel tipped tools, polishing required as long as $2\frac{1}{2}$ hr. to secure the desired finish.

This symposium will be concluded in an early issue.

TALKING SHOP

Watch Your Step!

Running a shop large or small, in this metal-working industry of ours, isn't all technique and selling. The proprietor or manager has to keep his eye on the buying side of his business too.

For instance, the Better Business

Bureau has just issued a warning to beware of agents representing certain foreign steel companies. These agents are trying to sell tool steel, files, lock nuts and washers, babbitt metal, etc. They are trying to work the old gag of a trial order, stating verbally that the amount will be only $10 to $25. The buyer signs a loosely worded contract that does not agree with the verbal representation of the agent. Then, the next thing he knows, he gets a big shipment and a bigger bill. One man thought he was buying $25 worth of steel until over a ton of metal arrived, and with it a bill for $2,000.

The only way to be sure you get what you are ordering is to specify on the order the total amount of material you want, and the price you will pay, in dollars and cents.

Saving on Small Accounts

Few seem to realize the cost involved in handling small accounts. Clerk hire and the cost of blanks or forms add up to astonishing amounts at times. Which reminds us of a friend who, years ago, was obsessed with the idea of carrying system to the nth degree.

After he had dropped many of his forms and accounts he told this story on himself. He needed a few feet of rope at home so he put through a regular requisition and had the rope charged to his account as an example of business ethics to impress the staff. When he finally got the bill for the rope he was paralyzed even though no profit had been charged. He could have bought it for half the price at a local hardware store.

Profiting by a similar experience a maker of special instruments adopted the practice of not billing any repair under a dollar. He saved money by not cluttering up the books with small accounts that cost more than the amount charged. In addition he built up a good will account that really counted.

Seniority and Skill

A machinist who has worked in one shop for twenty years stopped his superintendent one day and asked how to lay out a certain job. "Can't you do that?" asked the super. "No," admitted the workman,

"I need a little help." "All right," said the super, "I'll send up one of the apprentices."

And he did; and the apprentice, whose shop work was supplemented by practical principles of machining, had the job laid out in jig time.

The super knew that the older man would not relish being shown up by an apprentice, but he took that method of jarring him out of his lethargy. He believes that the man at the machine should keep up-to-date to meet the competition of the younger generation. Some workers complain of discrimination on account of their age (which statistics do not bear out) when their real trouble is dependence on seniority rather than skill.

Big Stuff

Most shop men do not have to make equipment so big that it buckles huge door frames when leaving the plant. But that took place recently, as disclosed by motion pictures being shown to engineering groups by the M. W. Kellogg Co., Jersey City. The largest welded cracking stills ever attempted were shipped to an oil refinery at Whiting, Ind. When the largest vessel was moved through the doors, the frame was found to be too small. Any delay in shipment would have been fatal, so the huge drum was pushed right through, buckling the columns. And when it appeared that the corner of another building would interfere with the drum, mounted on the flat car, there were no timid spirits that drew back from taking a bite out of the building. Fortunately the enormous load got by safely.

One of the largest floating derricks in the world was taxed to drop the drums one by one into the water for towing up the Hudson River, and through the N. Y. State barge canal and the Great Lakes to Whiting. The 1,385-mile water trip was necessary because none of the railroads between New York and Chicago had bridge clearances for the vessels, the largest of which was 16 ft. in diameter by 86 ft. long and weighed 230 tons.

Double Or Nothing

A few weeks ago an article appeared in one of our popular magazines which pointed out the advantages of double protection in airplane operation: two men to pilot the ship, two at the controls, two types of warning if the retractable gears are still up

when a landing is to be made and so on. We heard a similar idea at a plant the other day: "Why have only one $1.20 mercury switch controlling the actions of a $5,000 machine? In these new high speed traversing machines wouldn't it be better to know that the machine is protected from damage at the end of each stroke by a second switch in case the first goes haywire?" Of course the plant was making electrical gadgets but offhand we couldn't think of any reason to answer, "No." *The Editors.*

Material is fabricated into parts and sub-assemblies along both sides of the steel erection shop, and then is fed to the center aisle where the assembly jigs are located

Production Problem in Bus Building

Ten or twelve models of buses and trolley coaches are built, but infinite variety in specifications requires maximum flexibility in equipment and personnel

H. P. CLEAVER
Works Manager, The J. G. Brill Company

HORSECARS OF unusual design, which other firms refused to build, established the J. G. Brill Company as a custom car builder. John George Brill and his son, G. Martin Brill, had worked in that line before setting up their own business in 1868. But when the era of standardization for mass production came, such "tailoring" was somewhat of an obstacle. Until recent years there were almost as many types of street cars as there were orders. Not only did street railway operators buy to suit operating conditions, but every man in charge of rolling stock had his own pet ideas of how such cars should be built and insisted that they be incorporated in the design.

With the advent of the motor bus and the trolley coach, Brill was required to build three types of vehicles. Although developments of a mass production age, the newer types did not escape the curse of the electric trolley car—lack of standardization. Regulations being constantly issued by 48 states call for an infinite variety of devices, equipment and materials that must be provided before buses, for example, are permitted to operate.

Fortunately, car building experience has stood Brill in good stead while engaging in these newer fields. Bus designers have learned from the car builders that a chassis-less or integral body, essentially a modified box girder, will absorb stresses of stop-and-go service by dissipating them through the structure. Trolley coaches are essentially street cars in body design and are therefore of the integral body design.

Thus while a few models with identical equipment cannot be achieved, the production problem is simplified because trolley coaches and buses are built essentially the same way. This applies to fabrica-

tion, sub-assembly, main assembly and finish. The volume is not so great as known in automobile or commercial truck plants. In view of these conditions, the production problem lies somewhere between straight-line mass production of fixed standard units and the contract job shop where no two orders are alike. A high degree of adaptability is required in the personnel and great flexibility in the facilities, machinery, jigs, tools and equipment in order to maintain quality at the maximum rate of production, and yet attain the lowest cost consistent with these objectives.

The principal building, the steel erection shop, is 800 ft. long and has a wide center aisle providing four production lines. On each side machinery is arranged for performing the various operations such as punching, coping, welding, forming, drilling, and fabrication of sub-assemblies.

Small Scrap Loss

Materials for the body structure are aluminum alloy sheets, and steel and aluminum alloy angles and commercial shapes. Sheet metal enters a cutting room at one end of the erection shop. Three shears installed here cut the material to the proper shape. By shearing all sheets at one location, the scrap can be segregated according to kind and size and used for small parts, thus reducing discarded scrap to a very small percentage.

The flow of material divides as it enters the erection shop proper. Parts requiring press or brake operations pass down the right side of the shop where a battery of machines form these parts into their proper shapes. The other sheared parts pass down the left side of the shop where punch presses, coping machines, spot welders and other fabricating units produce finished parts.

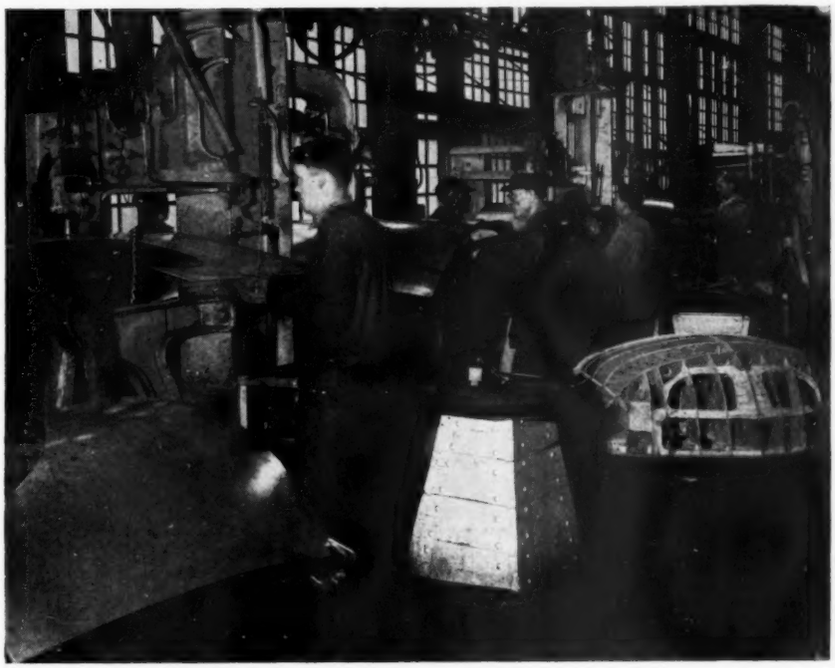
The large sheets that require forming pass down the left side of the shop to a group of Pettingell hammers, where the corner panels and other large pressings are formed. The operator draws the metal to the desired shape or curve by hammer blows and then tries it over the wooden form by covering its edges with chalk to find low spots. These are corrected without leaving wrinkles or marks on the finished shape. This work is done so accurately that two pieces required to form a large shape can be placed together and welded without difficulty.

While the sheet material is moving up the shop from the south end, the angles and commercial shapes are moving down the shop from the north end, where they are formed, drilled, or punched.

All of this fabricated material then passes out into the center aisle where an ingenious arrangement of jigs is used to sub-assemble the sides, ends and roof. These jigs are bolted to floor plates grouted to the concrete floor and slotted at the top to facilitate rapid attachment of the jigs. The plates are level and parallel with each other, so that it is possible to use both a spirit level and plumb line to assure accuracy of the jig.

Here on the sub-assembly floor is demonstrated the flexibility of the methods used. It is not uncommon to see five or six different models passing through the shop in one week. Each model requires a different set of jigs and the efficient ar-

Curved sections for the body are produced on Pettingell hammers and then tried over built-up wooden forms. Limited production of any one part prevents the use of costly presses and dies



Assembly jigs are bolted to level floor plates grouted to the concrete floor. These floor plates allow the jigs to be set up quickly for different models and with only the use of a spirit level and plumb line

Integral frame and body construction allows placing the assembled structure on bucks for installation of the motor and running gear. Here a special chain sling is lifting the axle and transmission into position

rangement and design of the floor plates concentrates all of this work in one place, thus involving a minimum of interruption to the flow of work when changing from model to model.

After the various sections have been assembled independently and riveted, they are brought together in the center of the shop. Here the sections are lined up, bolted and riveted into the complete body frame. The assembled frame is then carried up the shop to pedestals, or bucks, which are approximately 6-ft. high. With this completed frame in this position the horizontal Hall-Scott engine for a.c.f. buses, or electric motors for trolley coaches, and the wheels, axles, and other mechanical parts are lifted up into the frame from below by crane slings. These slings come down on either side of the bus as it rests on the pedestals.

When all assembly operations are completed, the body is lifted off the bucks and rolls out into the finishing shop for application of flooring and all woodwork, as well as final details of the equipment installation. The coach is then ready for paint, final interior finish, installation of seats, inspection and test.

Five or six units are produced daily without pits and, with few exceptions, every man works in a normal standing position. Hazards have been removed to such an extent that for the year ending June 30, 1937, the Brill plant finished third in the National Safety Council's nation-wide safety contest in the Rolling, Fabricating and Finishing Division.

More Spots Per Minute

Automatic operation of resistance welding machines has been perfected during the past fifteen years. Spot welders of the old style operating at peak production made 75 to 90 spot welds a minute. Welders with automatic controls now make over 200 spots a minute. Seam welders, which make a series of spot welds in such rapid succession that the resulting weld is a continuous seam, formerly did very well to produce three or four feet of welded seam per minute. Today, on the same machines with the latest automatic controls, the same grade of welding is done at eight to ten feet a minute.

It is in seam welding that the art of resistance welding reaches its highest expression. A poor set of rollers, which transmit the welding current to the sheets to be welded, may utterly ruin an otherwise well designed machine. Again it may be necessary to flood the work to be welded with water to prevent fusion of the rollers to the sheets instead of the sheets to each other. Fractions of a single cycle of welding current must often be controlled.

From a paper presented at the eighteenth annual meeting of the American Welding Society by Harry Landstrom, Nash-Kelvinator Corporation.

Closed Ends of Shells Reduced by Rolling

II—Deep-drawn shells may have the portion near the bottom reduced in diameter by a simple rolling process on a trimming and beading lathe

MARK GOLDEN

MY FIRST article on the rolling process for forming shells discussed reducing the diameter of the open end. The second problem is to reduce the diameter of the closed end.

An example of such work is the finger-grip portion of a stopper for a cocktail shaker. At *E*, Fig. 1, is a complete stopper shown dropped into the neck of the cocktail shaker, while *D* shows the two pieces that make up the stopper. Production of the finger-grip shell involves two drawing operations, and the rolling operation. The lower half of the stopper is a simple taper shell with a 3 per cent angle on the sides to fit the neck of the shaker. The two parts of the stopper are joined by closing them in a press.

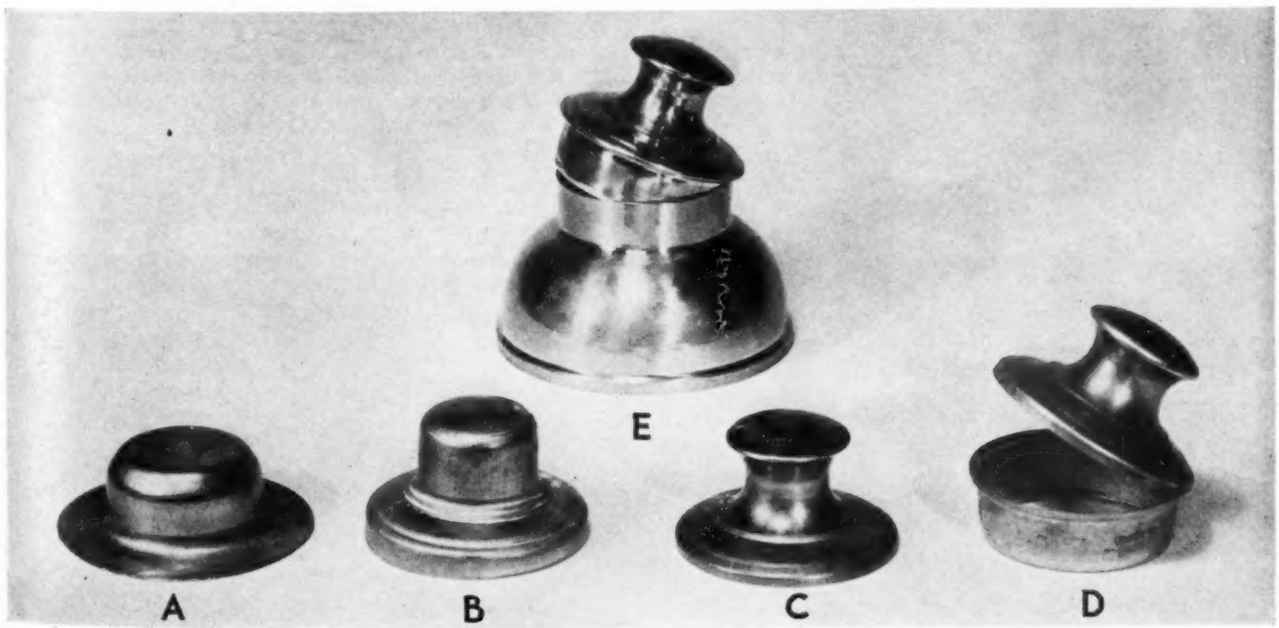
Material selected for this work was 22-gage deep-drawing copper. The first-operation die is shown in Fig. 2. This is an ordinary combination die of which the punch, pressure ring and cutting ring are hardened and ground. Drawing edge on the punch has a $\frac{3}{16}$-in. radius. The metal used was $4\frac{1}{8}$ in. wide, and the shell from this die is shown at *A*, Fig. 1. The drawn part of the shell is 2 in. in diameter by 1 in. deep.

The second-operation die is shown in Fig. 3. This die reduces the upper part of the shell to 1.550 in. in diameter and forms the balance of the shell to the required shape. Although the first-operation shell floats rather freely on the second-operation die, the punch centers the shell before any reducing, or forming, action takes place.

Shell *B* then goes to trimming and beading lathe, where it is trimmed and rolled to shape. Fig. 4 shows the set-up of the chuck, end block and trimming tool in open position, whereas Fig. 5 shows the shell after it has been trimmed and the roller has completed its work.

Fig. 6 gives a schematic layout of the tooling in which *A* is the

Fig. 1—Part *C* is made from part *B* by holding it on a chuck and rolling a neck for a finger grip. Part *C* is then closed on a taper-walled shell at *D* to form the stopper for a cocktail shaker

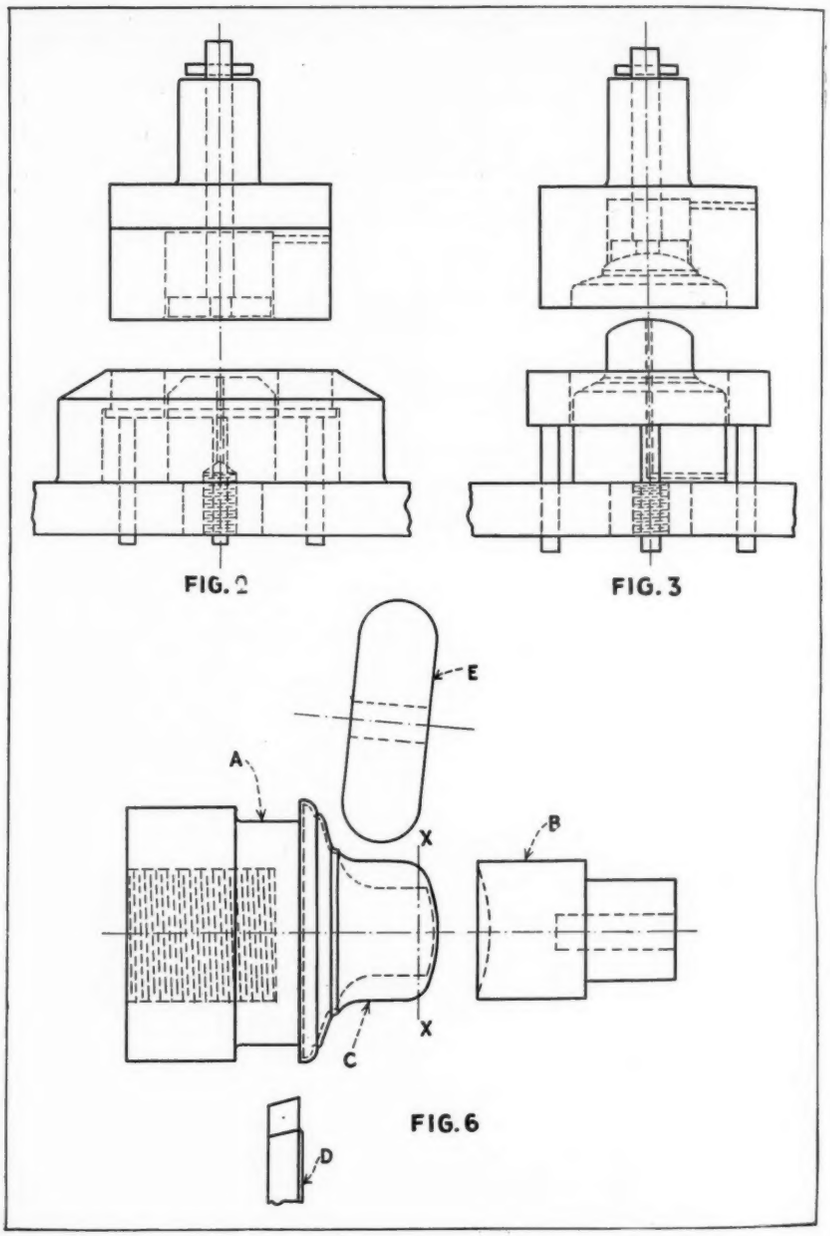


chuck that fits on the spindle of the lathe. Dotted line shows the reductions in diameters of the chuck to allow for rolling in of the metal. Tail block *B* has a concave end to fit the shell *C* and is attached to a spinners' ball-bearing chuck. It applies pressure to the shell and at the same time allows the shell to revolve freely with the chuck on the live spindle. Trimming tool *D* is mounted as shown in Figs. 4 and 5. The tool holder moves from left to right in order to trim the shell. Roller *E* has a radius of $\frac{7}{16}$ in. and is mounted in a cast-iron holder. Both the trimming and rolling tools are mounted on a slide operated by a lever to give it forward or backward movement, and thus to bring either knife or the roller into operation as required.

Rolled for 2 Seconds

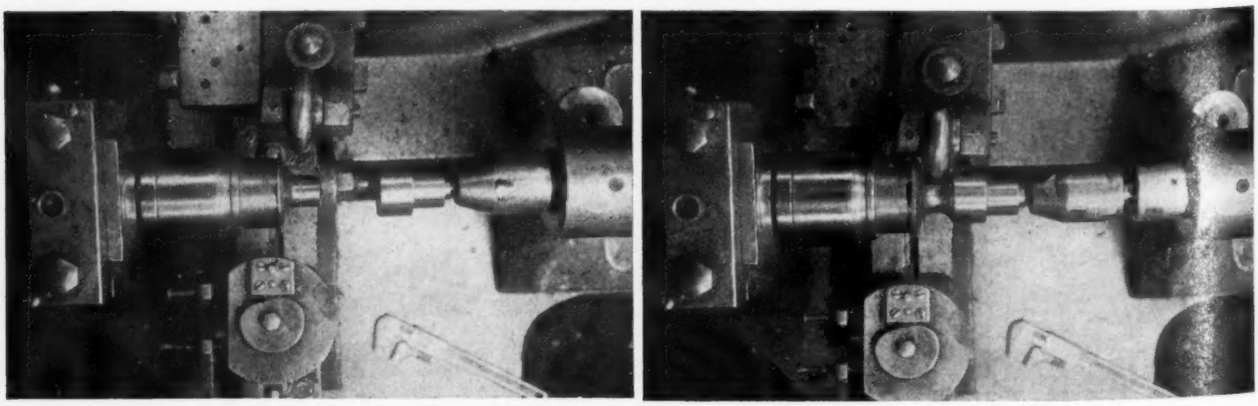
In operation, the shell as it comes from the press is placed on the chuck and is held in place by the tail block, to which pressure is applied by a lever and cam surface on the tailstock. After the shell is trimmed by an upward movement of the slide and a slight movement to the right of the front toolholder, the lever operating the slide is moved to bring the roller into operation. Steady pressure for about 2 sec. forms the shell *B*, Fig. 1, to the shape shown at *C*. At the start of rolling, the bottom of the shell at line XX has a diameter of 1.550 in., but the rolling action displaces the metal and increases the diameter at this end to 1.600 in. The diameter at the bottom of the groove is 1.115 in., which is approximately a reduction of $\frac{7}{16}$ in. from the original diameter. There is no increase in the length of the shell.

The third, and last, article by Mr. Golden on rolling shells will appear in an early number.



Figs. 2 and 3—Two drawing operations are necessary to produce the shell that is subsequently rolled. Fig. 6—Tailblock *B* presses the shell *C* firmly against the chuck *A* while the trimming tool trims the edge of the shell, and the roller follows and necks in the shell

Figs. 4 and 5—Open and closed positions of the tooling used on a trimming and beading lathe to roll a neck at the closed end of a shell



Transformer Type A.C. Arc Welders

An understanding of the advantages and limitations of a.c. welding is necessary to choose between this process and the d.c. method

E. F. STEINERT
Transformer Engineering Department
Westinghouse Electrical & Manufacturing Company

AN ATTEMPT was made to introduce a.c. arc welding in this country as early as 25 years ago, but the process was not generally adopted until recent years. Probably the greatest retarding factor was the lack of suitable electrode for use with alternating current. During the past five years, rapid strides have been made in the development of special electrode and reliable a.c. welding apparatus. The development of suitable electrode for alternating current, along with the general adoption of coated electrode for all classes of welding, has resulted in improved operating characteristics, increased safety of operation and greater economy. These developments and the recognition of the advantages of the process have been responsible for the rapid increase in popularity of a.c. for arc welding and its extension into practically all fields of welding.

Probably the most commonly recognized advantage of a.c. welding is the absence of magnetic blow. This blow effect which is associated with d.c. welding makes it difficult to deposit good welds in fillets and corners, particularly when welding at the higher current values. The entire absence of magnetic blow in the a.c. arc is one of the chief reasons for the increasing use of a.c. for high-current arc welding.

Another important advantage of the a.c. welder is its high electrical efficiency averaging 85-90 per cent, compared to 50-55 per cent for d.c. arc welders. This difference in efficiency represents a saving of 30 per cent in power consumption while welding. The idling or no-load loss of an a.c. welder is of the order of one-fifth that of a d.c. welder. This difference in idling loss also accounts for an appreciable saving in power consumption because a welder under average operating conditions is idling approximately 50 per cent of the time.

When power charges are made for maximum demand kva., an additional saving in power cost is possible with the a.c. welder. The maximum demand kva. of an a.c. welder is normally only slightly higher than that of a d.c. welder, but because of the lower power factor, the maximum demand kva. of the a.c. welder may be reduced considerably by power factor correction. By this means it is possible to reduce the maximum de-

A large transformer end frame is fabricated by arc welding

mand kva. of an a.c. welder to approximately 70 per cent of that required for a d.c. machine.

Inherent transient characteristics of d.c. welders involving current and voltage overshoot and time of recovery, are absent in a.c. welders. The stabilizing reactance on a.c. welders is instantaneous in action. Generator characteristics do not influence the operating characteristics of the a.c. welder, because the welder is usually connected to a power source of relatively large capacity.

Because of the alternating polarity of the a.c. arc, the concentration of heat at the work and electrode is about equally divided. For this reason there is less penetration at the lower current values, with an a.c. arc than with d.c. This fact has been found to be of advantage in welding light gage materials. At the higher current values, experience has shown that the a.c. arc has approximately the same degree of penetration as the d.c. arc.

Claims have been made that alternating current produces a stronger weld with less porosity and slag inclusion. The difference may be explained by the fact that the weld material is more fluid in an a.c. arc, and is agitated by the action of the alternating current, thereby causing the slag to rise to the surface more quickly. Comparative tests which have been made indicate that a.c. welds have an average tensile strength approximately ten per cent greater than those made with d.c. While sufficient comparative data may not be available at the present time to support any general claims, it may be safely concluded that a.c. welds are at least equal in all respects to those made with d.c. under similar conditions.

The initial cost of an a.c. welder is considerably less than that of a d.c. welder of equivalent output rating. Reliable low-priced welders with short-time rating for light service are economically serving the needs of a large number of users, thereby increasing the application of welding and building a market for welders of larger rating. A.c. welders are also serving the requirements of the speediest and highest current automatic arc welding process so far developed.

Disadvantages

Among the disadvantages of a.c. welding is the limitation in type of electrode which may be used. Except when auxiliary high-frequency stabilization is employed it is essential that a special covered electrode be used for a.c. welding to obtain the best results. The electrode covering serves to shield the arc and weld metal against the inclusion of oxygen and nitrogen from the atmosphere, prevents too rapid cooling of the weld and maintains an ionized arc path, thereby insuring the immediate reignition of the arc at each current reversal. Since covered electrodes are now used almost exclusively for nearly all classes of welding, this limitation in choice of electrode is no longer such a serious disadvantage. Auxiliary stabilization by means of super-imposed high frequency is available on welders of low-current rating for use when exceptional stability and ease of handling are desired in connection with the welding of light gage material, or with bare electrode.

From the standpoint of power supply, the chief disadvantage of the a.c. welder is the fact that it represents a single-phase load on the system. The a.c. arc is inherently single phase and cannot be converted to polyphase by means of transformers. Single-phase power is pulsating, while power flow in a three-phase system is continuous. In order to convert single-phase power to three-phase, or vice versa, it is necessary that energy be stored during a part of the cycle. Since static apparatus cannot store energy in this manner, it is not possible by means of transformers to convert the single-phase load of the arc to balanced three-phase power.

Low power factor is often cited as a serious disadvantage of a.c. welding. During recent years the development of special a.c. electrodes has permitted a large reduction in the open circuit voltage of a.c. welders. This reduction in striking voltage together with the higher arc voltage characteristic of covered a.c. electrode has resulted in an increase in power factor of a.c. welders to a value of 50-55 per cent, when operating at rated voltage.

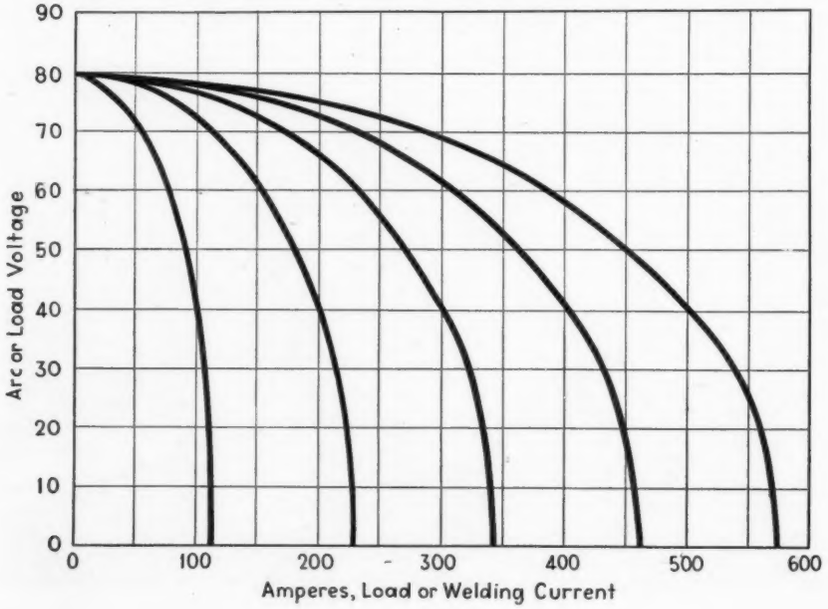
The welding load in an industrial plant is ordinarily a small proportion of the total load, and for this reason, the welders do not usually affect the power factor of the system to a great extent. Furthermore, welders are only operated approximately 40 per cent of the time, and during the remaining 60 per cent of the time they draw only the small no-load loss. The equivalent continuous kva. drawn by the welder is, therefore, small.

Nearly all a.c. welders now being built employ reactance for the series impedance. Reactance control has the adantage of high efficiency, low ratio of short-circuit current to welding current and inherent arc stability. Fig. 1 shows a set of typical volt-ampere curves for an a.c. welder, with reactance control.

Each curve in the group shows the variation in welding current with change in arc voltage and constant welder setting. The curves indicate that for the extreme variation from a 40-volt arc to short circuit, the welding current changes only fifteen per cent. This characteristic eliminates large welding current surges caused by variations in arc length or momentary short circuits across the arc.

Because of the time lag of approximately 60 deg. between the induced voltage and the welding current, the available striking voltage at the in-

Fig. 1—Typical volt-ampere characteristic curves for a.c. arc welders



stant of current reversal is approximately 86 per cent of its peak value. This condition insures immediate reignition of the arc after each half cycle of the current wave, thereby eliminating dead periods and producing a practically pure sine-wave current which is essential for good welding characteristics.

Current Control

A.c. arc welders, which employ variable reactance as a means of arc stabilization and welding current adjustment, require the use of one of the following fundamental methods of control:

1. Switches, or tap changers, which change tap connections on the transformer or reactor windings.
2. Movable-coil reactor similar in principle to the movable coil constant current regulator.
3. Movable-core reactor.

The first scheme has the advantage that there are no large movable parts. The disadvantages are that it involves switching electrical connections which must carry current of considerable magnitude in the case of large welders; current adjustment is obtainable only in definitely fixed steps, and hence a considerable number of tap connections must be provided to obtain fine enough current settings. Current adjustment cannot be made while the welder is operating. This type of control can be made simpler and cheaper than the other two types, and for these reasons it is used extensively on welders of small current rating.

The movable-coil principle provides a stepless control without switching electrical connections, and may be adjusted while in operation. The disadvantages of this type are: a mechanically weak coil, which must be supported and guided over its range of travel, and heavy flexible leads to the movable coil which are subject to breakage because of repeated bonding.

The movable-core principle of control is particularly well adapted to a.c. welders of medium and high current ratings. This type of control has long been recognized as having the combined advantages of the other two schemes. The windings may be rugged and fixed in position, no electrical connections need be changed, an infinite number of welding current settings are obtainable, and the welding current may be adjusted while the welder is in operation. Furthermore, the effects of welding lead reactance and line voltage regulation are readily compensated for by adjustment of the core setting. The principal objection to this type of design in the past has been the difficulty of designing it so that vibration and attendant noise of the movable core is not excessive. A design of this type has been developed employing a resilient support for the movable core, thereby permitting the inertia of the core to absorb the pulsating magnetic force. By this means and other special features the noise has been reduced to that of a low-pitched magnetic hum of a level hardly more noticeable than that of the arc itself.

Low-priced welders for light service take advantage of short-time rating and use tapped reactor control

Industrial Service

The standard NEMA ratings for a.c. arc welders are as follows:

Nominal Rating Amp.	Rated Current Change	Load (ARC) Voltage
150 — ½ hour	30 to 150	30
300 — 1 hour	60 to 300	40
500 — 1 hour	100 to 500	40
750 — 1 hour	150 to 750	40
1000 — 1 hour	200 to 1000	40

NEMA standard open circuit secondary voltage is 80 volts.

The continuous rating is 75 per cent of the nominal ampere rating.

A.c. welders for industrial service are usually of the movable-core type, and have Class B insulation consisting principally of asbestos materials. The arrangement of the core coils and connections of the windings of a 500-amp. welder of this type is illustrated in Fig. 2. The movable core travels vertically on the axis inside the reactor coil. As the core is raised or lowered, the gap at the lower end is varied, thereby changing the reluctance of the magnetic path and the reactance in the welding circuit. Minimum welding current is obtained when the core is on the lowest position and the maximum current when in the upper position. The design is so made that the distance of core travel is large, thereby giving a nearly uniform variation of welding current with change in core position. This condition is necessary to obtain a uniformly fine adjustment of welding current over the entire range.

The movable core is symmetrically located between the upper yokes of the main core, thereby balancing and effectively neutralizing the magnetic forces at the two small upper gaps. The pulsating force acting vertically on the lower end of the movable core is absorbed by the mass of the core

which is mechanically floating and isolated from the frame by means of resilient mountings.

Since there is a direct relation between the position of the movable core and the value of welding current, the travel of the core may be utilized to operate a pre-set current indicator. A scale, calibrated in amperes, is attached to the indicator drum. A small through-type current transformer is provided for operating an indicating ammeter.

This 1000-amp. rating is the largest standard a.c. welder at the present time. This rating is similar in design to that described above. This particular rating is used primarily in connection with high-current automatic welding and for this reason it is generally equipped with a motor drive to permit adjusting the welding current by remote control at the welding head.

A.c. welders of this general type may be operated in parallel to give the combined welding current output at a single arc. The requirements for parallel operation are that the units be connected:

1. On the same phase of the power supply circuit;
2. For the same primary voltage;
3. For the same secondary open circuit voltage;
4. For the same polarity.

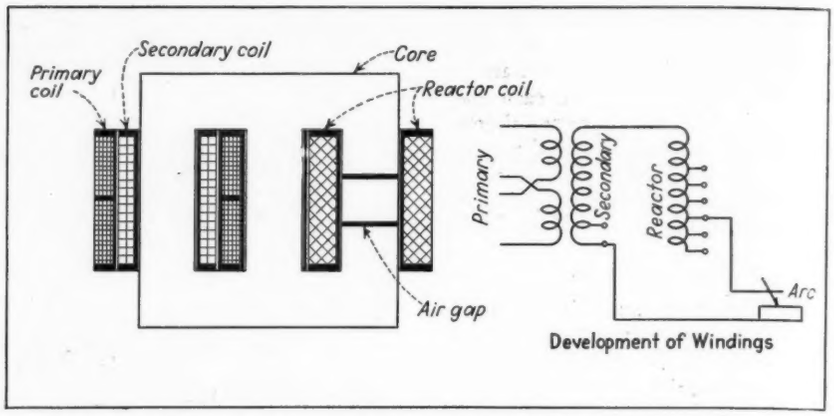
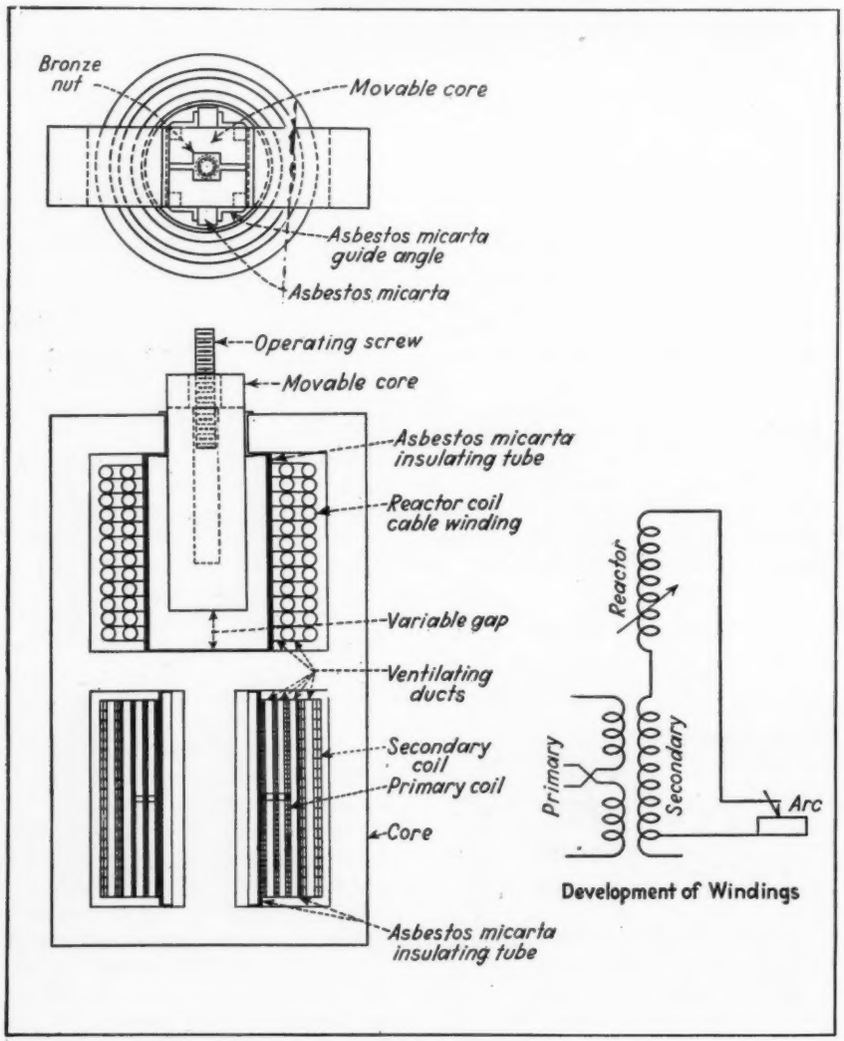


Fig. 3—A diagram of core and coil for the light-duty welder shows the arrangement of taps

When operating in parallel, each welder will deliver approximately the value of current for which it is adjusted, and the total current will be the sum of the current outputs of the individual units. Before attempting to operate welders of dissimilar type or design in parallel it is advisable to consult the manufacturer to determine whether the characteristics are suitable for parallel operations.

Fig. 2—Vertical travel of the movable core inside the reactor coil varies the reactance in the welding circuit



Welders for Light Duty

In addition to the standard industry class of a.c. welders there are many applications for a small, low-priced welder for light service to handle occasional welding jobs such as encountered in small repair shops and garages. Such a welder must have a broad enough welding current range to handle $\frac{1}{16}$ to approximately $\frac{5}{32}$-in. diameter a.c. electrodes. In order to reduce weight, size and cost, advantage may be taken of a short-time rating, because the application does not require steady operation for any considerable length of time. For this type of welder, the simplest and most reliable means of current control is that employing a tapped reactor with plugs and receptacles for changing connections.

The arrangement of core, coils and winding connections is illustrated in Fig. 3. The reactor portion of the design utilizes a part of the same magnetic circuit as that of the transformer, making a light and compact construction. On this particular design there are six reactor traps and two secondary voltage connections, the combination of which provides for twelve values of welding current adjustment. The current settings are designed to give equal percentage increments, thereby giving uniform steps in heat adjustment over the whole welding current range.

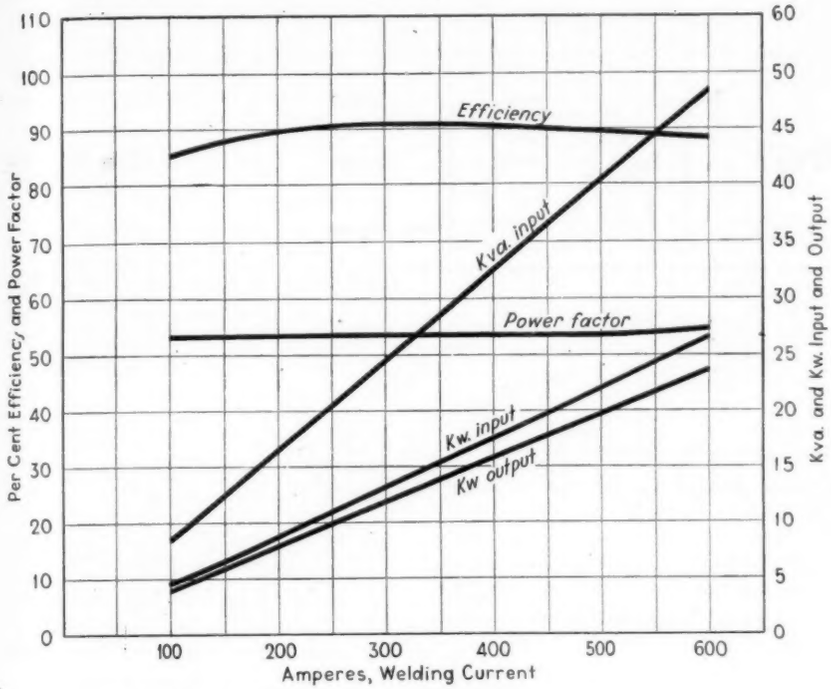


Fig. 4—Typical performance curves of a 500-volt a.c. arc welder based a 40-volt arc

The input-output method of measuring losses and efficiency of a.c. welders is seldom used commercially, because of the inaccuracy of the method and the number of variables involved. The losses are measured by the equivalent short-circuit method, and the performance characteristics are calculated from the measured losses and the output based on rated load voltage. A typical set of performance curves for the 500-amp. rating is shown in Fig. 4. These curves are based on an open circuit secondary voltage of 80 volts, and an arc or load voltage of 40 volts.

In certain installations, extra power charges may justify the use of capacitors for power factor correction. These extra charges may be in the form of a penalty charge for low power factor, or on the basis of reactive kva. consumption, or maximum demand kva.

A corrective capacity of approximately four kva. for each 100 amp. welding current may be used for estimating purposes.

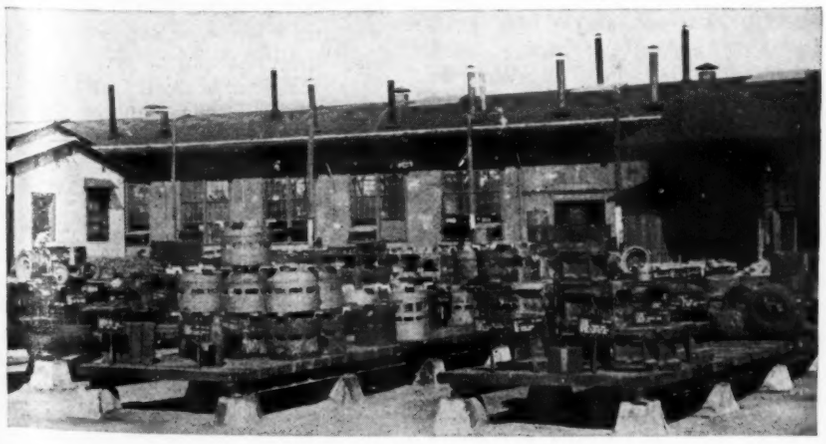
Example: Assume that power factor correction is to be applied to a 500-amp. welder. The required capacitor rating is 20 kva. Taking the kva. and kw. input data from curves, Fig. 4, the corresponding data with power factor correction at two different values of welding current are calculated as follows:

	At 500 Amp.	*At 200 Amp.*
Kva. input	40.7	16.5
Kw. input	22.2	9.0
Reactive kva. with 20 kva. capacitor	$\sqrt{40.7^2 - 22.2^2} = 34.2$	$\sqrt{16.5^2 - 9^2} = 13.8$
Reactive kva.	$34.2 - 20 = 14.2$ (lagging)	$20 - 13.8 = 6.2$ (leading)
Input kva.	$\sqrt{14.2^2 + 22.2^2} = 26.4$	$\sqrt{6.2^2 + 9^2} = 10.9$
Primary P.F.	$22.2/26.4 = 0.84$ (lagging)	$9/10.9 = 0.82$ (leading)

Storing Railroad Spares

Storing spare parts in the open is customary at many railroad division points. In some places the value of these parts runs up into more money than many realize, largely owing to the lack of standardization of motive power equipment.

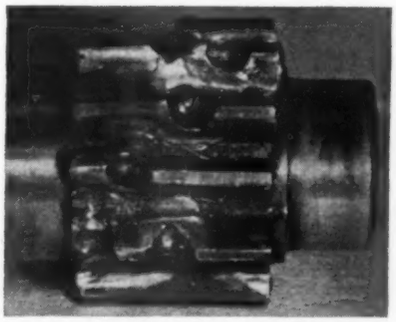
The Waycross, Ga. shops of the Atlantic Coast Line have the well worked out plan for storage shown. Concrete bases support discarded rails which carry planks that form the platforms. Stringers inside the rails prevent shifting of the planks. The platforms are at a convenient height.



Badly Mutilated Pinion

M. L. SPANGLER

The mutilated pinion illustrated is 6-pitch, 1½-in. face and has 12 teeth. It was taken from an industrial truck after having been in service for twelve years.



This damaged pinion was not fractured in any place. It is a remarkable example of what toughness modern heat-treatment will give to steel

Mutilation was caused by the balls of the shaft bearing getting out of the race and into the teeth of the pinion and its mating gear. To me it seems to be an excellent example of modern heat treatment.

The teeth of the mating gear were dressed up and it was put back into service. But the teeth of the pinion were too hard to be dressed, so it was replaced by a new one.

ROUND TABLE

Beginner's Luck

"You're sure a bum psychologist, Ed. What was the big idea of letting Barney go before he'd been in your place for more than a couple of hours? I worked with him, as I told you when I suggested you hire him, a number of years ago and know that he can run circles around a lot of the men you think are your best." Al was unusually angry as he walked into Ed's office early one afternoon. "Barney stopped in to see me on his way home, just a short time ago, and told me all about it. He says you didn't even let him finish his first job."

"That's the trouble, Al. He didn't finish it. I was satisfied with your recommendations, and he knew all of the answers when I talked with him before he was hired—then the first thing he did was to spoil that form tool Reynolds has been hounding us for. He's supposed to be a first-class tool and diemaker, too."

"Sure, I know he spoiled that precious tool for you, Ed, but did you take the trouble to find out what happened? He told me that his master form tool dug in just as he was finishing up; that happens to the best of men, Ed. I've seen you spoil a couple of pretty expensive tools yourself, back in the days when we were both on the bench."

"You're not intimating that I should have given him another chance, are you Al?"

"Why not? All of us have our off days—remember when you spoiled that hob some years ago; you got so darned mad that you ripped off your apron and went home for the day. Maybe Williams should have fired you for that?"

"He knew that I wasn't entirely to blame for that error, why as I recall it the spindle-nose of the lathe had been damaged and I didn't know it. Besides, nothing went right for me that day; it's a wonder I didn't walk into a street car on the way home."

"Maybe you should have checked that lathe over before you started that job, Ed. Barney was a little on

edge this morning—starting out in a strange shop; he didn't know a soul here. The man cannot be found who is perfect all of the time, and its particularly hard to do your best when you've been dumped in among a bunch of strangers."

"Hey! Am I to understand that I'm being bawled out for not giving your friend another chance, or is it just that you hate to see a man you've recommended lose out?"

"No matter what the reason may be, don't you think you've got a riding coming to you—when you fire a capable man for something that could happen to the best toolmaker that ever picked up a file? It seems to me that you're partly to blame for giving such an important job to a new man. You might have expected something to happen—with him trying to make a good showing on his first day here."

How much consideration should be shown a new man? Is a warming-up period necessary in the shop?

DISCUSSION

Better or Worse

Al is likely to be disappointed if he thinks he can stop spoiled work by charging the workmen for their spoilage. After finishing my apprenticeship, I spent about four years knocking around the country as a journeyman machinist, working in more than thirty shops. In only two of these shops, as I remember it, did they charge spoilage to the workmen. Both of these shops were full of "floaters" and both held a poor reputation among local good mechanics. Poor management, expressed through poor foremanship, caused their excess of spoiled work. I believe that at least one of these shops is now out of business.

I am a believer in straight piecework on production jobs and contract prices applied to tool, repair and maintenance jobs. Of course, the worker gets paid only for the number of finished pieces that pass inspection. He does not receive pay for spoiled work. The machinist, on a contract job, who spoils part of a jig, die or machine, should make over the spoiled pieces at his own expense, since the employer has to stand the expense of material, previous labor and overhead.

—HERBERT M. DARLING
Superintendent
Wells Tool Company

I have seen some expensive jobs spoiled by mechanical leeches who bluffed their way past the employment manager, donned white aprons and stalled along for several weeks because the foreman was too en-

grossed in other duties to detect them. These are the "birds" who should be made to pay for spoiled work; not the fellow who is trying his best and, because of some misfortune, suffers for hours over an unintentional slip. While Al's scheme would, in a measure, promote caution, it would encourage dishonesty and destroy whatever incentive exists in a man to do his best in order to get a job out in good time. Anything that destroys contentment kills the spirit of cooperation.

Most spoiled jobs are the result of miscalculation—no man, unless he is guilty of sabotage, is going to spoil a job purposely; he usually prides himself too much in a job well done. The foreman can do his part in helping to reduce the number of spoiled jobs by being alert and by properly guiding his workmen. Blame should fall on the man in charge when he assigns costly work to someone who has not proven himself capable of performing the job.

—J. HOMEWOOD

Glorified Clerk?

Many have the ability to write an intelligent report who would not be competent to give, off-hand, fit allowances, make an accurate recheck with a height gage, or tell by observation whether a scraper hand was removing the metal he should.—So the Super thinks the foreman should get his report finished within a few minutes after the men leave!

It is during the last working hour that the foreman must be most alert. He has to see that jobs are completed and that plans are made for the work to be started in the morning. This becomes increasingly difficult if his mind is on a prospective report. —B. HAWLEY

Foremen who make daily written reports only are performing a part of their responsibility; the foreman does not step down in class when writing this report. It is a natural procedure after a day of investigating, supervising and correcting to render a detailed account of the day's work to a superior. This should be required of each foreman and I believe that, in the majority of cases, the foreman does not begrudge those extra moments of overtime spent in making reports. The captain keeps a log of the movements of his ship, why, then, shouldn't the foreman record the essential elements of each day's work in his shop? —G. MCARDLE

Weak Kneed?

Red-tape often becomes so rigorous in large shops that both output and efficiency suffer. The responsibility for many mistakes, as a result, is blamed by one department on another and, unless dealt with effectively, may develop into a farce. I remember an instance similar to that which occurred in Ed's department.

A piston for a large oil engine was being rushed through the shop and had passed successfully through the various operations until it reached the grinding department where, somehow, the job-sheet was lost. Acting on the hide-bound instructions of the progress department, the progress man refused to allow the job to be moved until an inquest was held. In desperation, the foreman appealed to the manager who promptly told the progress department a few homely truths. Had the foreman been of the weak-kneed type, he would not have had the fortitude to show up a fault in his own department or to have challenged the decision of the progress man. A serious delay of a "breakdown job" would have occurred.

—R. G. HEWITT
Thornton Lodge, Huddersfield, England

Cooperation never can be overdone. Strikes would be fewer and ill-feeling would vanish if we could have a little more cooperation between management and labor. More cooperation among our machinists would result in fewer mistakes and production of better work.

Cooperation is the oil that cuts down friction between men in the plant and out. The manufacturer who relies on his judgment alone is frequently swell-headed and narrow minded. Modern manufacturers realize that they do not know it all and that the other fellow's slant on things may be as valuable as their own. The best thought of more than one and the best effort of more than one is worth more than the best thought or effect on the part of a "rugged individualist."

—ROGER C. DICKEY
The International Paper Box Machine Company

Where There's Smoke

Thirty-five years ago, when I was working twelve hours a day and five and one-half days a week, we were never allowed to smoke anywhere in the plant or on the grounds, but that did not stop smoking. Men sneaked away out of sight to smoke whenever they had the opportunity. Today, when the average working day is eight hours and smoking is prohibited inside the factory, men still find a way to evade the rules and enjoy a smoke.

Rightly or wrongly, smoking seems to have increased during recent years and it is easily noted that men appreciate being permitted to smoke while working. The privilege, when given, is not abused. I believe that it makes for greater contentment at work and output will be increased rather than decreased when permission is given to smoke on the job. The men will stay at their work instead of sneaking away. —ARTHUR SILVESTER

It seems to me that Al's scheme to place the smokers on exhibition in a glass cage would not be received too well, nor would it tend to concentrate the attention of the non-smokers on their work. Would it not be simpler, Al, to let those who wish smoke openly in the washrooms, as they have been doing on the sly? The great majority of smokers, if appealed to, would not abuse the privilege.

A better plan, to my mind, would be to declare two-minute smoking periods in the plant three or four times a day. These periods could be followed by a fire inspection if necessary. This would not entail any loss of time, since a man would not need to stop his work to smoke.

—ALFRED M. WASBAUER
Malaunay, (Seine-Inf.), France

I have long felt that the fire hazard resulting from smoking in the average fire-proof constructed machine shop has been greatly overrated. While insurance rules and state laws are very rigid in this respect, I believe that it would be beneficial to employer-employee relations, without any real increase in fire hazard, if smoking were permitted on the job. It is preferable to have the men on the job, rather than sneaking back in the corner or lavatory for a hidden smoke, thereby breaking a rule. If management closes it's eyes to the breaking of one rule, it is logical to expect that they will close their eyes to the breaking of others. This certainly leads to a more or less lawless attitude in the shop resulting in the loss of discipline.

—O. W. WINTER
Factory Manager
Columbus-McKinnon Chain Corp.
Chisholm-Moore Hoist Corp.

IDEAS FROM PRACTICAL MEN

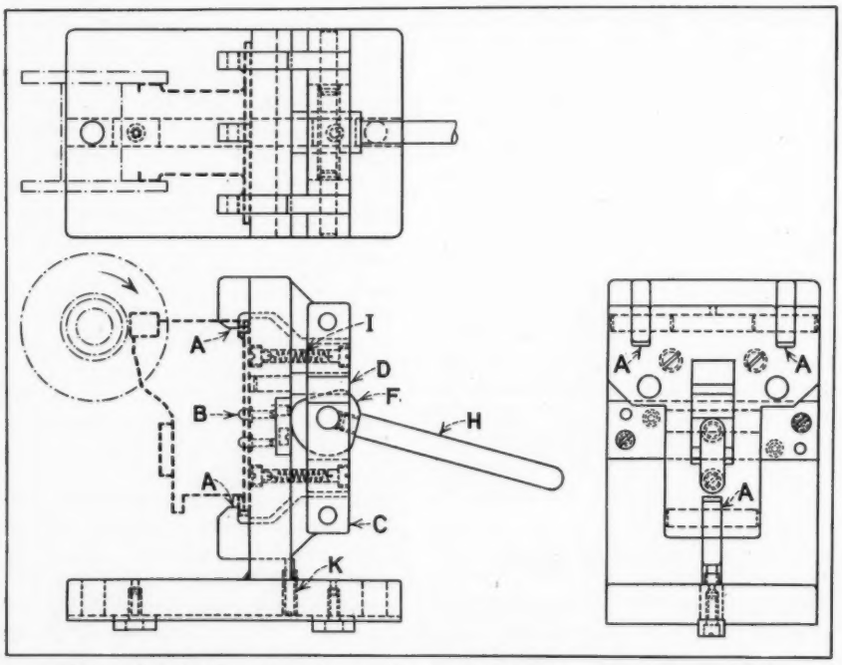
Cam-Actuated Straddle Milling Fixture

WILLIAM B. GREENER

The fixture illustrated was designed for machining the outer faces of two lugs on carburetors by straddle milling. The body of the fixture is an angle plate made by welding two steel plates together as shown.

The work, indicated by heavy dotted lines, is held against the vertical member by the three clamps *A*, being located by the two pins *B* engaging holes previously drilled. The clamps are pivoted to the movable plate *C*, which is guided by the pins *D* and is operated by the cam *F*. Pushing down on the cam lever *H* causes the cam to move plate *C* away from the vertical member and tighten the clamps on the work. Pulling up on lever *H* brings the cam into the off position and releases the clamps from the work. The pull springs *I* then draw plate *C* toward the vertical member, moving the clamps far enough to permit work removal.

The pressure of the cam is taken by a hardened steel plate. Screw *K* prevents the lower clamp from dropping down too far when released.

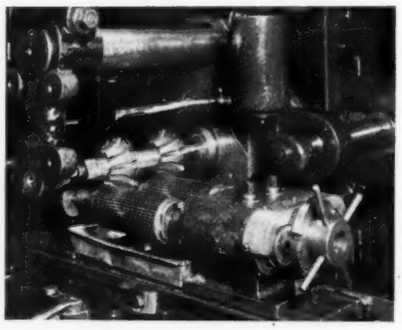


The work is held against the vertical member by three clamps operated by a cam and is located by two pins engaging holes previously drilled

Eighteen Teeth at One Pass

CHESTER H. FRANKLIN

Here is a time-saving device used by the Nathan Manufacturing Co., New York, in cutting the teeth in ratchet wheels for its positive, force-feed lubricators. As will be seen 14 blanks are strung on each mandrel and two sets are cut at once in the double indexing fixture shown.



Nine ratchet teeth are cut at each pass by each of the two special cutters

The cutters are specially designed to cut 8 teeth at each pass, covering one-sixth of the circumference of the blanks. The index plate at the end has but six notches, indicating that six passes completes the 54 teeth on the ratchet wheels, with a re-cut on two-teeth. This combination of special cutters and indexing mechanism makes it possible to produce a large number of ratchet wheels on a single machine.

Kinks Did It—Why?

FRANCIS W. SHAW
Whitworth, Lancashire, England

I am sorry if my words quoted by Reginald Hines in an article under the above title (*AM*—Vol. 81, page 1011) gave an impression of ambiguity. What I intended to convey was this: That of a heavy blow, much of the energy is absorbed by a plastic deformation of the material, for it is stressed beyond the elastic limit; of a light blow, all the energy is expanded in doing useful work in endeavoring to release the stuck arbor.

The question is allied to that which is now disturbing the testing experts, at least in Great Britain: Is the Izod impact test reliable as usually made? It seems to have been proved that as usually carried out the test is not a real criterion of the impact strength of the test piece, for a goodly proportion of the energy of the falling pendulum is expended in the plastic deformation of supporting elements and even of the floor. It is said that 4 per cent of the Izod figure represents energy transmitted to the earth as a shock wave. Thus, tests carried out in different "earth" circumstances on like specimens can easily vary. Machines of rather different build might similarly affect the readings.

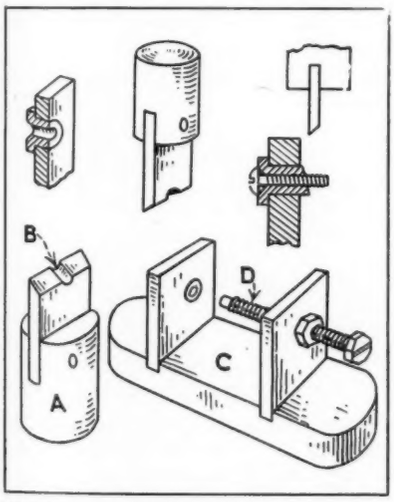
The Shore test is open to like suspicion, as was once amply demonstrated to the writer. Noticing a

workman testing crankshafts held in a vise, I requested him to alter the position in the vise of a just-tested shaft and test it again. The rebound of the ball was considerably changed. Again a difference in the "earthing."

Cutting Off Screws in the Punch Press

CHARLES H. WILLEY
Superintendent of Manufacturing Hoyt Electrical Instrument Works

Recently, due to the strike situation, we found ourselves in danger of being held up in assembly for lack of screws of a certain length. We had plenty of longer screws of the same diameter and pitch as the ones we needed, so we resorted to cutting



By these simple tools screws were cut to a shorter length without damage to the threads or leaving a burr

them off to the required length in a small power punch equipped with the tools illustrated.

The punch *A* has a half-round notch ground in it at *B* and the shearing edge is ground at an angle of 50 deg. The lower unit of the tools consists of the fixture *C* having a bushing in one of the uprights in which to put the screws. The other upright carries the adjustable stop screw *D* to gage the amount to be cut off. The face of the bushing is ground to such an angle that the cutting edge of the notch in the punch meets the body of the screws at the half-way diameter of the bushing. The action of the tools from then on is that of cleanly shearing the screws without pulling the punch, for dulling is prevented by the outward springing of the blade. This would not be the case if the cutting edge of the punch and the face of the bushing were not ground at an angle. These angles on the punch and the bushing are the secret that permits shearing off the screws without damage to the threads.

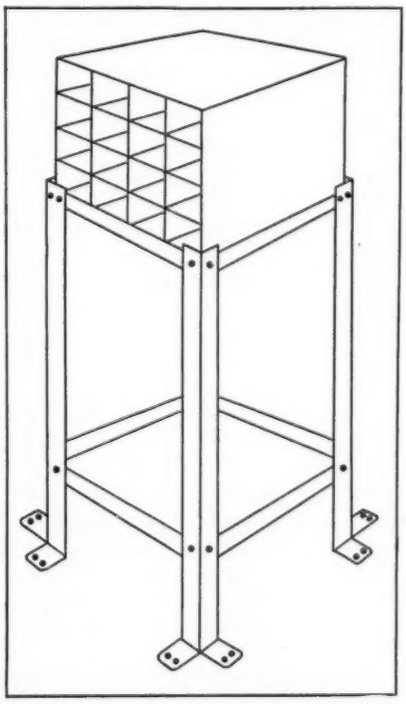
Rack for Flat Tool-Steel Stock

C. F. FITZ

Many users of ground, flat, tool-steel stock keep it loosely in a box under the bench. Every time they want a piece of a certain thickness they have to handle and "mike" nearly all of it before finding a piece suitable for the particular job in hand.

To obviate that condition and to have the stock conveniently at hand, the rack illustrated was built. It was made from 20-gage black iron and has sixteen compartments, each 4 x 4 x 18 in. The partitions have a lap of $\frac{1}{4}$ in. and are held in place by $\frac{1}{8}$-in. round-head stove bolts. Tabs made from the same material as that of the rack are attached to the top of each compartment and are stamped with the thickness of the material stored therein.

The rack can be stood on or under the bench or it can be mounted on a stand as shown. The stand is made of $\frac{1}{8}$ x 1-in. angle iron with stiffeners of flat iron and is fastened to the floor with wood screws. With such a rack, stock of the thickness required can always be found quickly.



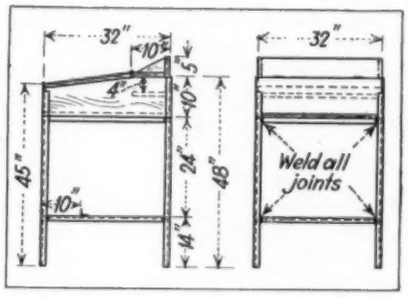
The rack is made from 20-gage black iron and has sixteen compartments each 4 x 4 x 18 in. for storing ground, flat, tool-steel stock

Economical Shop Desks

GAYLORD G. THOMPSON

A large manufacturing concern had to replace a number of shop desks. The old desks, used by time-study men and shop foremen, were constructed of steel and had become battered, bent and loose jointed. Also some of the bolts and rivets were missing, so that something had to be done about furnishing desks that would have long life and small maintenance expense.

The illustration shows a desk of just that type. It is 32 in. square,



A shop desk of this type will stand much hard use, and when the wooden part is damaged it can be replaced at small cost

45 in. high in front and 48 in. at the back. The framework is made of $1\frac{1}{4}$-in. angle iron welded together. The desk proper is made of $\frac{3}{4}$-in. pine and fits into the four corners formed by the angle-iron legs and is supported by the upper crosspieces. If the wooden part becomes marred too badly it can be removed and replaced at a small cost. The sloping part of the top is hinged so that it can be lifted up and papers, etc. can be put in the body. A sheet of cardboard or heavy paper pinned to the sloping top with thumb tacks makes a good writing pad.

Desks of this type have proved to be popular with the men who use them.

Lathe Centers Aligned by Eccentric Collar

ARTHUR SILVESTER

In an article under the above title (*AM*—Vol. 81, page 617) H. Moore describes a method of aligning lathe centers by means of an eccentric collar. In discussing the article, R. G. Hewitt (page 991) says that Mr. Moore's method is far from satisfactory and advocates the use of a plug gage as a feeler between the bodies of the centers and a piece of steel held in the toolpost.

In my judgment, neither of the

methods will enable the centers to be aligned so that the work will be turned straight. If the bodies of the centers are straight, in good condition and are accurately of the same diameter, they could be aligned by the use of a dial indicator held in the toolpost and applied alternately to both centers, adjusting the tailstock center until the reading is the same at both centers. But even then there is no guarantee that the lathe will turn work straight. If the tailstock spindle is so worn as to be loose in its bearing, the centers will not stay in alignment. If the lathe has been used for a long time in turning work of one length and is then used for turning work of a much greater length, any previous alignment of the centers will be of no avail, because both the carriage and the ways would be worn in turning the shorter work.

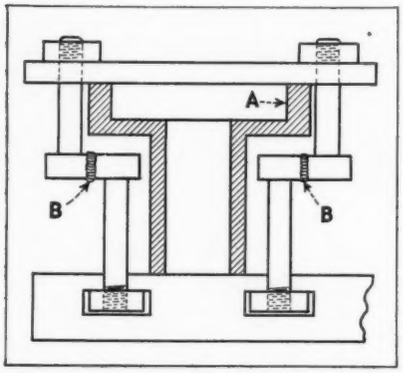
To turn work accurately straight it is necessary to take a cut over it, caliper it for straightness and adjust the tailstock center, if necessary, and to repeat the operation until the work is turned straight.

Offset Hold-down Bolts

J. E. MOORE
Department of Industrial Education, Wichita High School East

We had to do some milling on the casting *A*, but in attempting to clamp it on the table of the machine we found that the hold-down bolts would be farther apart than were the outer T-slots in the table.

A young man showed us a stunt that he had used in the shop where



The sides of the bolt heads were welded together and when the bottom bolts were screwed into nuts in the T-slots the top bolts spanned the casting

he worked. Bolts of the proper length were placed with the sides of their heads together, but with the threaded ends pointing in opposite directions, and were welded together at *B*. The ends of the bottom bolts were screwed into nuts in the T-slots, leaving the top bolts with enough offset to span the casting. We keep these bolts in the toolcrib and have found several jobs in which they have helped us out of difficult situations.

Proper Use of Wheel-Dressing Diamonds

J. R. WHITTLES

The article by Peter Veit on indexing the diamond (*AM*—Vol. 81, page 1106) recalls to mind a few words told by an expert in the grinding field in discussing turning the diamond to create new cutting faces. He said:

"It is not true that a diamond must have a sharp corner or a new cutting edge in order to be of service in truing the grinding wheel face. A diamond after it has been used for a short time is a much better tool for truing than a new diamond with a sharp corner, because when a new diamond becomes worn a little it will maintain for a greater length of time the area exposed to the grinding wheel. It can readily be seen that a small point or a sharp edge will soon be worn away and a true face of the grinding wheel, which should be a perfect cylinder, cannot possibly happen, since the diamond is a greater distance from the center of the wheel at the finish of the truing because of this wear."

The above condition is especially true for wide wheels. To obtain the best results from the diamond it is necessary only to turn it occasionally, and not for each dressing. The diamond should travel across the wheel face at a very slow and uniform speed. The combination of a light cut and a slow traverse will prolong the life of the diamond, keeping its point fairly cool. Too fast a traversing feed will cause the wheel to produce a mottled appearance on the finished work because a helix will be formed on the face of the wheel instead of the nice, smooth surface so desirable.

The operator can make the face of the wheel either rough or smooth by changing the depth of cut or the speed of the diamond in traversing its face. Accuracy and finish of the ground work are brought about only by the degree of carefulness in dressing the wheel, and any carelessness will certainly show up in the finish grinding.

It is very important that the diamond be held securely so that it will not chatter, and that the point touches the wheel a little below the center to prevent it from digging in.

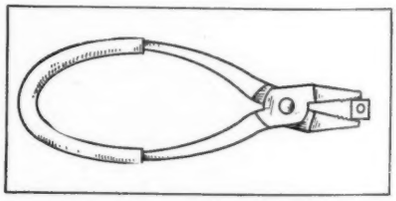
Often the operator is given a diamond that is too small for the width of the wheel and it will wear away too fast, with the result that the face of the wheel is tapering. Of course, the error is small, but tenths of thousandths are being dealt with and the high spot will dig into the work and cause a series of feed marks. A diamond that is too small will not stand up under the heat generated in dressing the wheel. It will wear away very rapidly and sometimes it will crack from overheating. A generous stream of grinding lubricant if correctly applied will help to dissipate some of the frictional heat.

For rough grinding the traverse of the diamond across the face of the wheel should be much faster than for finish grinding, leaving a rough, open wheel face that will remove stock very fast. Many operators dress the wheel more often than they should for rough grinding, wearing out the diamond faster than necessary.

Small Rubber Hose Keeps Pliers Open

PAUL C. BRUHL

In the production line ordinary pliers were used to insert small nuts into cavities where the bolts were screwed into them. The workman complained about the bother of open-



A short piece of small rubber hose placed over plier handles automatically opens the jaws when closing pressure is released

ing the pliers, closing them on the nuts and opening them again to release the nuts after placing them in the cavities. This will be understood when it is stated that about 1,600 nuts had to be placed during an 8-hr. shift.

The workman was then furnished with pliers equipped with a spring to open them automatically, but sometimes the spring was in the way of the workman's fingers. Finally a simple solution was found. A short piece of small rubber hose was bent in a U-shape and the ends were slipped over the plier handles. The elasticity of the hose served to open the jaws automatically when closing pressure was released, and it did not interfere with proper manipulation.

AMERICAN MACHINIST *Reference Book Sheet*

Stock-Production Sizes of Bolts

SIMPLIFIED Practice Recommendation R169-37 for stock-production sizes of machine, carriage and lag bolts has been issued by the National Bureau of Standards, United States Department of Commerce. The recommendation was effective from Nov. 1, 1937, and was made at the request of the American Institute of Bolt, Nut & Rivet Manufacturers.

Chief benefit to the user of this recommendation is prompt delivery of sizes readily available from manufacturers' and distributors' stocks. It is also of value in design work and in the preparation of specifications. The list of stock sizes is sufficiently broad to cover 95 per cent of the total requirements of the country. Adoption of the standard will effect a reduction from 896 to 584 sizes of bolts covered, or an elimination of approximately 35 per cent. Material savings are expected to result to the manufacturer, distributor and user. Square-head machine bolts are tabulated on the following page. Carriage bolts are not included. They can be obtained by sending five cents to the Government Printing Office, Washington, D. C., and requesting the above standard.

(See page 128 for Table 3)

Table 1—Hexagon-Head Machine Bolts [1]

[American Standard Regular]

Lengths, In.	Diameters, In.						
	1/4	5/16	3/8	1/2	5/8	3/4	7/8
1/2	**						
3/4	*	*	*	**			
1	*	*	*	*			
1 1/4	*	*	*	*	**	**	
1 1/2	*	*	*	*	*	*	
1 3/4	**	**	*	*	*	*	
2	*	**	*	*	*	*	**
2 1/4				**	**	**	
2 1/2	**	**	*	*	**	*	**
2 3/4				**			
3		**	**	**	*	**	**
3 1/2			**	**	*	**	**
4			**	**	**	*	**
4 1/2				**	**	**	**
5				*	*	*	**
5 1/2				**	**	**	
6				**	**	**	**

Table 2—Lag Bolts [1]

[American Standard Regular Square Heads]

Lengths, In.	Diameters, In.						
	1/4	5/16	3/8	7/16	1/2	5/8	3/4
1	*	*	*				
1 1/4	*	*	**				
1 1/2	*	*	*	**	*		
1 3/4	**	*	*				
2	*	*	*	*	*	*	
2 1/2	*	*	*	*	*	**	**
3	*	*	*	*	*	*	*
3 1/2	*	*	*	*	*	*	**
4	*	*	*	*	*	*	*
4 1/2	*	*	*	**	*	*	*
5	*	*	*	**	*	*	*
5 1/2		**	*		*	**	
6	**	*	*	**	*	*	*
6 1/2					**		
7			*		*	*	**
8			*		*	*	*
9					**	**	*
10					*	*	*
11						**	**
12						**	*

[1] One asterisk (*) represents stock items of maximum demand, and two asterisks (**) stock items least frequently used. All other sizes are considered specials.

AMERICAN MACHINIST *Reference Book Sheet*

Stock-Production Sizes of Bolts

Table 3—Square-Head Machine Bolts[1]

[American Standard Regular]

Lengths, In.	Diameters, In.										
	¼	5/16	⅜	7/16	½	⅝	¾	⅞	1	1⅛	1¼
½	**	**									
⅝		**									
¾	*	*	*								
1	*	*	*	*	*	*	**				
1¼	*	*	*	*	*	*	*				
1½	*	*	*	*	*	*	*	**			
1¾	*	*	*	*	*	*	*	**			
2	*	*	*	*	*	*	*	*	**		
2¼	*	*	*	**	*	*	*	*			
2½	*	*	*	*	*	*	*	*	*		
2¾	*	*	*		*	*	*	*			
3	*	*	*	*	*	*	*	*	*		
3¼	**	**	*		*	*	*	*			
3½	*	*	*	*	*	*	*	*	*		
3¾			*		*	*	*	**	**		
4	*	*	*	*	*	*	*	*	*	**	**
4¼					**	**	*	**			
4½	*	*	*	*	*	*	*	*	*	**	**
4¾					**	**	**				
5	*	*	*	*	*	*	*	*	*	**	**
5½	*	*	*	*	*	*	*	*	*	**	**
6	*	*	*	*	*	*	*	*	*	*	*
6½	**	**	*	**	*	*	*	*	*		
7	**	*	*	**	*	*	*	*	*	**	**
7½			*		*	*	*	*	*		
8	**	**	*	**	*	*	*	*	*	**	**
8½			*		*	*	*	**			
9			*	**	*	*	*	*	*	**	**
9½			**		*	*	*				
10			*		*	*	*	*	*	**	**
10½					*	*	*				
11			*		*	*	*	*	*	**	**
11½					**	**	**				
12			*		*	*	*	*	*	**	**
13					*	*	*	**	*		
14					*	*	*	*	*	**	**
15					*	*	*	*	*	**	**
16					*	*	*	*	*	**	**
17					**	*	*	**	**	**	**
18					*	*	*	*	*	**	**
19					**	**	*	**	**	**	**
20					*	*	*	*	*	**	**
22					**	*	*	**	**		
24					**	*	*	**	**		

[1] One asterisk (*) represents stock items of maximum demand, and two asterisks (**) stock items least frequently used. All other sizes are considered specials.

NEWS OF THE INDUSTRY

Western Metal Congress Program Includes More Than 100 Papers

Machineability of steel screw stock, steel and aluminum forgings and high-speed steels are among subjects

LOS ANGELES—Nationally recognized authorities from all parts of the country will take part in the Western Metal Congress sessions at the Pan-Pacific Auditorium and the Biltmore Hotel from March 21-25. Western sections of eighteen national societies are cooperating under the auspices of the American Society for Metals, as reported (*AM*—Vol. 82, page 80d). The program will be divided into sections dealing with machineability, foundry, mining, chemical, aeronautics, petroleum and general industries. The Western Metal Exposition will be held simultaneously with the Congress and will be arranged by W. H. Eisenman, secretary of the American Society of Metals. A condensed program follows:

Monday, March 21

9:30 a.m.

Address of Welcome—John Disario, metallurgist, Columbia Steel Co.

Response—Dr. George Booker Waterhouse, professor of metallurgy, Massachusetts Institute of Technology; president, A.S.M.

Fabrication and Application of Stainless Steels Containing Up To and Including 16 Per Cent Chromium—Prof. Bradley Stoughton, dean of engineering, Lehigh University.

Fabrication and Application of Stainless Steels Containing 18 Per Cent Chromium and Over—Dr. V. N. Krivobok, associate director of research, Allegheny Steel Co.

2:00 p.m.

Testing for Wear—Fred Arnold, metallurgist, Kobe, Inc.

New Developments and Applications of Hard Facing Material—C. C. Pendrell, Haynes-Stellite Co.

Grain Size Control in Carbon Steels—Charles H. Herty, Jr., metallurgist, Bethlehem Steel Co.

High Tensile Structural Steels in Transportation—A. F. Stuebing, railroad mechanical engineer, United States Steel Corp.

8:00 p.m.

Dr. A. Allan Bates—The first of a series of five lectures under the title, "Fundamentals of Ferrous Metallurgy".

Wednesday, March 23

9:30 a.m.

Metals in the Aircraft Industry—J. R. Goldstein, Douglas Aircraft Co., Inc.

Recent Developments in the Application of Magnesium Alloys to Aircraft—Arthur W. Wicston, metallurgist, Dow Chemical Co.

Design and Production of Alluminum Alloy Aircraft Forgings—A. A. Handler, manager, and L. W. Davis, technical dept., forgings division, Aluminum Co. of America.

Engineering Alloy Steels (S.A.E. Specifications)—Prof. Bradley Stoughton, dean of engineering, Lehigh University.

2:00 p.m.

Steel Forgings for Aircraft—Waldemar Naujoks, chief engineer, Steel Improvement & Forge Co.

Stainless Steel for Aircraft—Carl de Ganahl, president, Fleetwings, Inc.

X-Ray Inspection of Aeronautical Materials —Tom A. Triplett, Triplett & Barton Laboratories.

Aluminum in Diesel Engines—P. B. Jackson, engineering department, castings division, Aluminum Co. of America.

Thursday, March 24

9:30 a. m.

Carbon and Low Alloy Tool Steels—J. P. Gill, chief metallurgist, Vanadium Alloys Steel Corp.

High Speed and Highly Alloyed Tool Steels —J. P. Gill.

Controlled Furnace Atmospheres—E. E. Thum, editor, *Metal Progress*.

Hardenability As It Affects Heat Treated Parts—Dr. M. A. Grossmann, director of research, Carnegie-Illinois Steel Corp.

2:00 p.m.

Machinability, Especially of the Steel "Screw Stocks"—J. D. Armour, metallurgist, Union Drawn Steel Co.

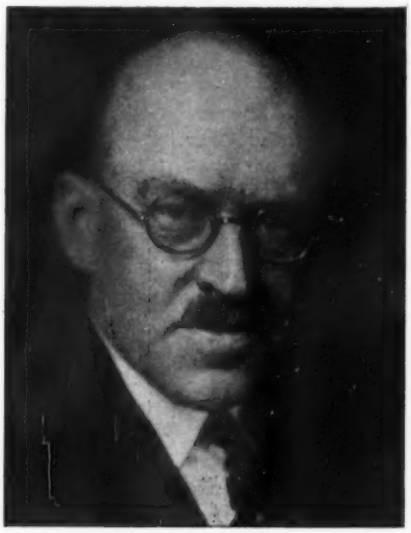
Machinability of Alloy Steels—Harry W. McQuaid, metallurgist, Republic Steel Corp.

Machinability of All Types of Castings, Including Malleable, Gray Iron and Steel —E. K. Smith, metallurgist, Electro-Metallurgical Co.

Machining of Cast and Wrought Aluminum Alloys—W. A. Dean, Aluminum Research Labs.

Ralph Flanders to Speak at A.S.T.E. Dinner

DETROIT—Forums instead of technical sessions will be the feature of the first annual convention of the American Society of Tools Engineers in Convention Hall, March 9-12. These forums will be held evenings to permit attendance at the Machine and Tool Progress Exhibition and for plant visits during the day time. J. R. Weaver, director of equipment, inspection and testing, Westinghouse Electric & Mfg. Co., Pittsburgh, will act as chairman at both forums. Speaker at the annual dinner, Friday night at the Hotel Statler, will be Ralph Flanders, president of Jones & Lamson Machine Co.



RALPH FLANDERS

The Wednesday evening session will be devoted to "Standards for Surface Quality" with the introductory paper by Dr. E. J. Abbott, president of Physicists Research Co. Following Dr. Abbott, Harry T. Woolson, executive engineer, Chrysler Corp., and past-president, Society of Automotive Engineers, will discuss the subject from the viewpoint of what such specifications mean to the engineer. R. V. Hutchinson, designing engineer, Olds Motor Works, and F. J. Malone, assistant to the president, Hercules Motors Corp., will discuss the subject from the production man's point of view.

On Thursday night the topic "Selecting and Buying Equipment" will be introduced by Edwin Johnson, manager of costs studies, Packard Motor Car Co., and will be discussed from the shop angle by P. W. Brown, superintendent, Wright Aeronautical Corp., from the purchasing viewpoint by Tom Higgins, purchasing agent, General Electric Co., and from the supplier's side of the story by A. H. d'Arcambal, consulting metallurgist, Pratt & Whitney Co.

DETROIT LETTER

Car makers planning to enlarge their production as used car sales increase . . . Ford spending huge sums for new equipment at Rouge . . . Delay in tool and die programs may swamp shops with eleventh hour orders . . . Piece-work rates reappear

DETROIT—The automotive industry hasn't turned completely the well-known corner, but it has stuck its foot around and found the paving fiairly firm. Wind-pressure of consumer sales resistance has stopped increasing and the barricade of used car stocks is beginning to crumble under the attack of all producers. With factories and dealers concentrating almost all selling efforts on used cars, the ratio of used car sales to new car sales has been as high as 4-to-1 for some companies. This means that increased buying of new cars isn't far away.

Maintaining a reputation for being the most resourceful industry in the country, the automobile industry will shortly go into newspapers, onto billboards and on the air with a week's whirlwind used car advertising campaign. Over a million dollars will be spent on this program mapped out and supported by the Automobile Manufacturers Association in collaboration with Ford. That will help a lot. Then a vigorous drive for Spring new car business will start soon and production and employment will be enlarged. That should lift Detroit out of the blue funk in which it has been steeped the past few weeks.

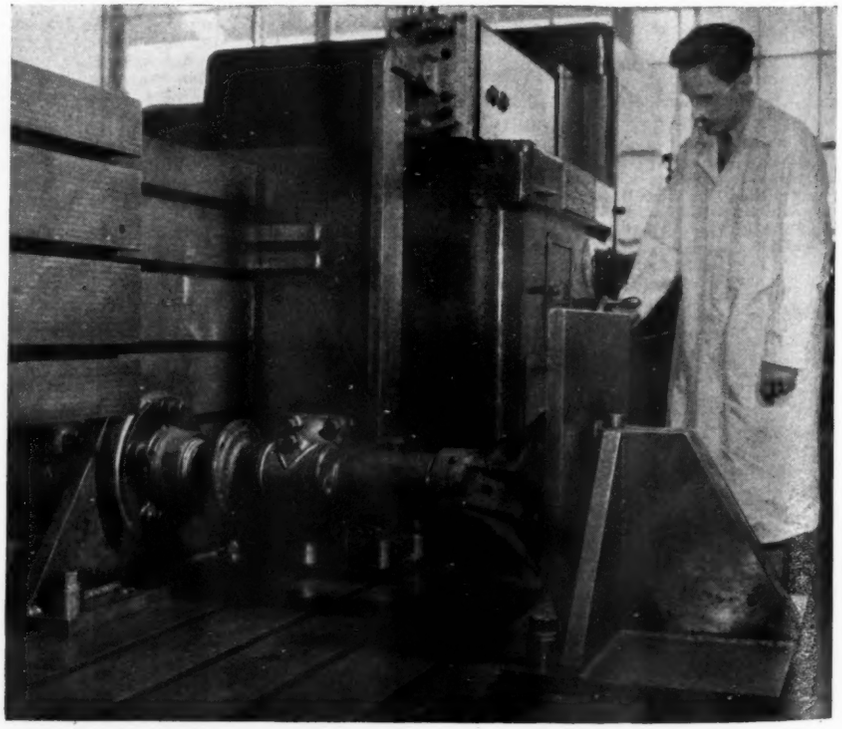
Good Truck Sales

It would be erroneous, of course, to give the impression that the industry is "going to town" this year. If it sells three million new cars it will be doing well, compared with over five million in 1937. No matter how much passenger car sales dip, truck sales should be fairly good. The point is that the industry over-built cars last fall at the time when the bottom suddenly dropped out of the retail market, and individual car makers have been trying to readjust things since then, holding production down below the level of new car sales. Meanwhile new car sales suffered a terrific slump because the big problem was to get rid of "trade-ins." With Detroit the worst hit city in the country from the standpoint of employment, it isn't surprising that the spirits of the "dynamic city" drooped so badly. But one of the amazing things about this automotive capital is its ability to raise its head up quickly again after having been laid low by a wicked economic uppercut.

That automotive leaders haven't lost faith in the future is proved by the fact that one leading architect is working on over forty million dollars of construction work released by motor car companies. Plenty of equipment will be bought this Spring in Detroit, with Ford in the vanguard. Ford already has ordered over $2,500,000 of stamping presses for its new pressed steel plant at Rouge and still has some $2,000,000 of presses and other machinery yet to buy. It is reported that some of the big presses will be located on the second floor, being placed on huge pedestals which run down into the ground. Thus Ford will increase its capacity for making bodies.

Ford has given some machinery releases for its new consolidated tool and die shop, but has a large amount of equipment yet to purchase, including about 50 milling machines. It is roughly estimated that the outlay for machine tools for this shop will be two or three million dollars. In addition, Ford is expected to spend several million dollars on its car tooling program for 1939. So the Ford program, taken as a whole, will provide equipment builders with a substantial volume of business this year.

What General Motors and Chrysler intend to do isn't so clear. The uncertainty of the past 30 days led the General Motors high command to withdraw its approval of 1939 car designs which were "all set." The result is that the brass hats from the various divisions have been spending much time lately



"A Million Miles of Road in a 10-Ft. Box"—Described thus by a Ford engineer, this fatigue tester subjects part in a few hours to all the stresses they would meet in years of ordinary use. A photo-electric stroke regulator increases the stroke as the metal weakens and yields, and thus keeps the effect of each stroke constant, the same as in service

at the styling section of the corporation trying to make up their minds whether they want conservative or radical car designs next year. Indications are that Chevrolet, Pontiac and Buick may spend considerable money for new equipment. It is possible that one G.M. division will erect a sizable manufacturing plant west of the Mississippi this year; if it does, that will call for huge machinery purchases.

Chrysler had a large tooling program planned for 1939, with much new equipment involved, but the recent contraction of business has modified its ideas for spending money. It is now believed that the Plymouth division, which is contemplating a new engine for '39, will content itself mostly with retooling present machine tools rather than indulging in a big machinery buying program. Just how much Chrysler will spend probably will be determined by what happens to production and sales the next 60 days.

There has been a pick-up in tool and die releases since the recent settlement of the New York show date. Nash has led the procession, with a good deal of heavy die work, but Fisher Body and other G.M. divisions, particularly Chevrolet, have not been far behind. However, tool and die specifications for 1939 have been slow in coming through and unless the process is speeded up, history is apt to repeat itself and shops be swamped with work at the last minute, as a few years ago.

Higher Tool and Die Costs?

That situation may easily mean higher tool and die costs because of necessity for overtime work. Also, the sudden spurt may act as an incentive to labor unions to step out and do things. A few years ago the Mechanics Educational Society pretty much controlled unionized tool and die shops, but the past two years the United Automobile Workers have made heavy inroads, now controlling about 40 plants representing more than half the capacity in this district. The U.A.W. may try to use a prosperous period to squeeze out the M.E.S. and set up a labor monopoly. The hitch in such a plan might be the lack of enough money to put over a big campaign. The U.A.W. lately has had to do some tall scratching for finances to maintain the status quo, let alone doing any new crusading.

U.A.W. negotiations for changes in the G.M. contract have been quietly dropped for the moment.

Employers in Metal Trades Refuse to Be Tied to Rigid Wage Scales

Trends in labor relations indicate the spread of reason and lessening of violent prejudices

FRANK RISING
Labor Editor, American Machinist

Labor union strategy supports the view that steel labor problems must first be solved before similar problems can be solved by companies in allied metal-working lines. This is because of the basic importance of steel manufacture.

Today, most of the unions are waiting for two things: an extended upturn in the business curve, and a settlement between steel manufacturers and steel labor which will stay put. Without the first, there still is a chance that the second can be attained, if the principle of flexibility in wage scales wins out over the older idea of rigidity.

Looking at the contracts now being signed between the Steel Workers Organizing Committee and the unionized steel mills, an observer would be blind not to see at once that the agreements are all of the "fingers-crossed" type. Two ways of escape are evident: Either the contracts contain the 20-day clause by which U. S. Steel and S.W.O.C. can reopen negotiations and drop the agreement, or they are signed for short terms. Since termination date is of no significance with the break-away clause included, those contracts written on the Big Steel plan run indefinitely. Where the clause is omitted, the manufacturing contracts run only until May 30 of this year.

What this means is simply that employers are refusing to crawl out on a limb, bind themselves to a rigid wage-scale, and face the prospect of continued depression. The unions likewise aren't eager to make things too definite, because if a boom comes along later this year they want to take a cut of the extra pie.

Meanwhile, other unions and other employers are waiting to see how the steel business goes. It's like watching a weather-vane on a windless day, with your plans dependent on whether a freezing gale comes from the north or a gentle wind blows out of the south.

In the opinion of observers close to the scene, it is useless to attempt to predict the immediate future of labor contracts, while steel limps along at a curtailed rate and allied metal-working industries mark time. There is a possibility that the metal unions will listen to a proposal for flexible wage-scales hooked to production rates, but they won't listen during a recession, and that's flat. In the meantime, employers generally are going along as cautiously as possible, keeping as cheerful as possible, and hoping that labor will keep its head.

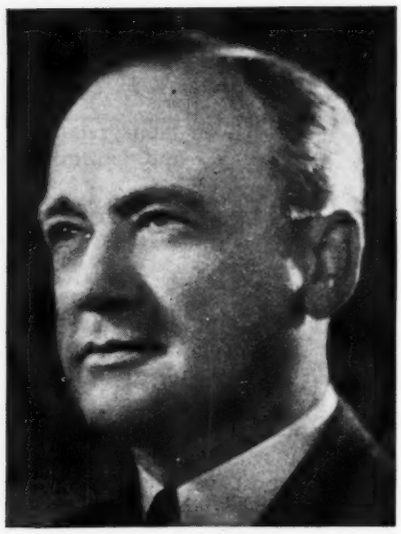
Good signs of the day include the revival of attempts to bring the A. F. of L. and the C.I.O. together (with the Administration playing a much stronger hand than it did last year), the move by several unions to clean out malcontents and rabble-rousers from local steering jobs, and the independent attitude of some unions which want to run their own show without dictation from headquarters politicians of the big federations. Taken with the sobering effect of the business slump, these trends seem to indicate the spread of reason in 1938, and a consequent diminution of violent prejudice.

Much Spent for Coercion, Little for Cooperation

CHICAGO—Only ten cents is spent for cooperation in the field of labor relations for every dollar for coercion, said Russell L. Greenman, assistant manager, Department of Manufacture, Chamber of Commerce of the U.S., when speaking before last week's meeting of the Personnel Division, American Management Association. That is the ratio between current appropriations for the United States Conciliation Service and for the National Labor Relations Board.

John H. Goss, vice-president of the Scoville Mfg. Co., declared that, "Collective bargaining is the finest tool yet devised with which to carve out the answer to the problems of our relations with our employees. The Scovill plan now 20 years old gives the employee the right to challenge either singly or in groups. The company has 10,000 employees and there are four A.F. of L., four C.I.O., and five independent groups."

PHIL HUBER



W. E. WHIPP

Phil Huber Elected a Director of N.M.T.B.A.

NEW YORK—At a meeting of the board of directors of the National Machine Tool Builders Association here on Feb. 4, Phil Huber, president and general manager, Ex-Cell-O Corp. was chosen a director. He fills the vacancy left by resignation of Newton A. Woodworth, formerly first vice-president of the Association. W. E. Whipp, president of the Monarch Machine Tool Co., was unanimously chosen first vice-president to succeed Mr. Woodworth.

Mr. Huber was recently elected to his present position with Ex-Cell-O as reported (AM—Vol. 81, page 1224k) upon the resignation of Mr. Woodworth because of ill health. One of the organizers of the firm in 1919, Mr. Huber has been prominently associated with the growth of the company and its major machine tool and equipment developments.

Mr. Whipp was elected to the board of directors in 1937 and became second vice-president at the same time. He has been active on several of the committees of the Association.

Thirtieth Anniversary Number Available

If any reader of *American Machinist* would like to secure a copy of Vol. 30, No. 45, published November 7, 1907 to complete a set, or for any other purpose, V. H. Foy, 5616 Pershing Ave., St. Louis, Mo., has one that he would like to dispose of. This number was the thirtieth anniversary number of *American Machinist* and Mr. Foy says that his copy is in excellent condition.

Machine Tool Orders Take Another Drop

CLEVELAND—Domestic machine tool business is back to the general level of late 1934—early 1935, according to figures released by the National Machine Tool Builders Association. January's domestic index of 43.2 was only 33 per cent of the average monthly index of 129.1 for 1937. Domestic orders placed were only 18.5 per cent of those during April, the best month of last year.

Foreign business, while it dropped in January, maintained the strong tone of the last half. Although the index for foreign orders dropped 14 points during the month, their buoyant effect held the total placed by the machine tool industry above the average for the last five years which, for 1933 to 1937 inclusive, had an average index of 96.6.

Gear Manufacturers Change Meeting Date

American Gear Manufacturers Association has announced that the dates for the annual meeting at the General Brock Hotel, Niagara Falls, Canada, have been changed to April 25-27. The program follows:

Ball Bearing Design for Modern Heavy Duty—Thomas Barish, Marlin Rockwell Corp.

Chain and Sprocket Drives—J. S. Watson, Link-Belt. Co.

Characteristics of General-Purpose Motors—I. Koenig, Reliance Electric & Engineering Co.

Conjugate Tooth Forms—W. P. Schmitter, the Falk Corp.

Gear Sounds—R. S. Drummond, National Broach & Machine Co.

Industrial Photography—J. L. Boon, Eastman Kodak Co.

Non-Metallic Materials—H. R. Moyer, Westinghouse Micarta Works.

Practical Problems in Handling Men—F. H. Fowler, Foote Bros. Gear & Machine Co.

Rates of Depreciation—H. N. Mathias, Westinghouse Elec. & Mfg. Co.

University Training of Mechanical Engineers—Prof. Frank Mickle, University of Michigan.

Welding—H. S. Card, National Electrical Manufacturers Assn.

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders			3 Months' Average Index	% Foreign to Total Orders
	Domestic	Foreign	Total		
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	19
April	232.5	50.0	282.5	219.8	17
May	161.4	47.1	208.5	234.2	23
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	33
August	129.5	50.3	179.8	180.9	28
September	119.0	91.7	210.7	187.2	44
October	89.1	62.9	152.0	180.8	41
November	63.3	64.4	127.7	163.5	50
December	53.5	89.2	142.7	140.8	63
1938 — January	43.2	75.2	118.4	129.6	63

Distribution of Orders

Average Index of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting								
	1936				1937				1938
	1st Quar.	2nd Quar.	3rd Quar.	4th Quar.	1st Quar.	2nd Quar.	3rd Quar.	4th Quar.	Jan.
200-up	13.0	17.2	15.8	28.4	31.6	38.5	33.4	23.0	21.1
100–199	24.6	32.6	28.8	30.2	32.8	29.1	30.2	23.2	18.8
60– 99	22.4	19.0	22.9	19.5	16.4	15.1	15.7	18.6	15.0
20– 59	26.5	21.8	21.7	15.2	12.2	11.4	12.7	22.0	27.8
Less than 20%	13.5	9.7	10.8	6.7	7.0	5.9	8.0	13.2	17.3

WATCHING WASHINGTON

Administration begins efforts to turn business tide . . . Price policy announced to restore "balance" . . . Kennedy calls ship costs too high . . . Gold sterilization stopped . . . Housing and farm bills are passed and signed

WASHINGTON—A critical point has been reached in politico-economic affairs. Election Day is a little over eight months off. Business is in a state of depression; call it "recession" or "oppression" and the sound is no sweeter.

It becomes increasingly obvious that if anything is to be done to turn the tide it must be done promptly. Eleventh-hour palliatives will not have the desired political effect; they are likely to be disturbing to business without having time to produce any upturn. That is why Congressmen, particularly those who have to stand for reelection, are becoming restive and why talk of inflation or other "shots in the arm" grows apace.

High and Low

Symtomatic of this condition and suggestive of early action is the President's approval of a "price policy." Many prices, according to his statement, are too low, in fact have reached bottom. Prices for textile products, raw materials, semi-manufactured goods, foods and farm products have slumped to too low a point. But not all prices are low; the structure, the Administration contends, is "out of balance." "Controlled" on "monopolistic" prices are still too high. Those for steel and some kinds of building materials bear the brunt of the criticism.

What is to be done is not entirely divulged; official denial of inflationary measures are absurd since artificial raising of prices in one form or another is inherently inflationary. Maybe the time is not ripe for further devaluation, but spending, credit extension and exercise of control powers by the government are freely urged. Even so it is not clear what the means will be to put a floor under some prices and a ceiling over others.

If the $800,000,000 Navy building program goes through, as likely it will despite isolationist and pacifist opposition, 160,000 tons of steel will be needed; 50 per cent of the total construction cost will go into machinery of all classes.

In a letter to the President, Joseph P. Kennedy, retiring chairman of the U. S. Maritime Commission, stated that high bids by shipyards both on merchant and Navy vessels, threaten to balk rehabilitation of the merchant marine; he advised that after two years work has been assured American yards, shipping companies be empowered to have cargo vessels built abroad at approximately half the cost. As a "last resort," he recommended that the government build the ships.

One inflationary step was made when Secretary Morgenthau halted gold sterilization. Gold acquired by the government up to $100,000,000 in any quarter-year will be deposited in Federal Reserve Banks instead of being put into the sterilization fund. About $30,000,000 in gold acquired since January 1 has by this action been immediately released for deposit in the Reserve banks.

OLD FORMULAS RETRIED

In casting about for ways and means to reverse the "recession" the New Deal turns again to expedients used in its early days. The new farm act seeks the same objectives as the old Triple A; the housing act extends the aims of the F.H.A.; and enlargement of W.P.A. activities reverts to the policy of big relief expenditures.

Latest of the old formulas to be revived is that of R.F.C. loans to industry. In response to a letter from the President, Chairman Jesse H. Jones announced the removal of restrictions on loans to business, especially small business and the railroads; R.F.C. has $1,500,000,000 available and is ready to lend all to qualified borrowers.

It now remains to be seen whether the ghost of N.R.A. will return in the form of a corporate licensing bill or a wage-hour bill.

History again repeats itself in the talk about "self-liquidating" public works. The phase has an attractive sound and heralded the Administration's first big spending program. The Buckley bill proposing an $8,000,000,000 toll-road system has renewed the contention that the government could spend money in this way and get it back. The theory is as little likely to work now as it did in the past. On the other hand, the President is said to be favorable to a policy of excess condemnation; this practice, whereby more land is condemned than needed and then sold by the government as improved real estate, is followed quite generally in England. The "unearned increment" goes to the government rather than the land owner who, it is claimed, does not deserve to be enriched in this way.

Regardless of the defects of the farm bill—and there are many in the form of agricultural bureaucracy and drain on the nation's credit—the short term effect will be favorable. Farm prices will be raised as indicated by the President in his price statement last week. The control over crops and crop prices given the Department of Agriculture is definite and far-reaching enough to achieve this objective.

Building Ballyhoo

Passage of the housing bill may also be regarded as a positive factor. There are many differences of opinion as to whether the legislation will have the desired effect of stimulating building. Well informed sources believe that it will be effective and that it will be accompanied by buy-your-home ballyhoo to sell the public matching the old Blue Eagle days.

Another influence, noted by the President to bolster prices, is the $250,000,000 addition to the relief outlay. Instead of cutting its rolls WPA will be able to add 500,000 until July 1. The bill passed the House last week by a 351-23 vote, amended only to bar aid to aliens.

To top off these steps toward reversing the recession, the government will at least give the appearance of an improved relationship with business. Comparisons for White House use are being made of annual reports of industrial concerns. Apparently the purpose is to show how much more socially minded business has become. It would not be surprising for the President to announce an evolution in the attitude of business toward its social responsibilities.

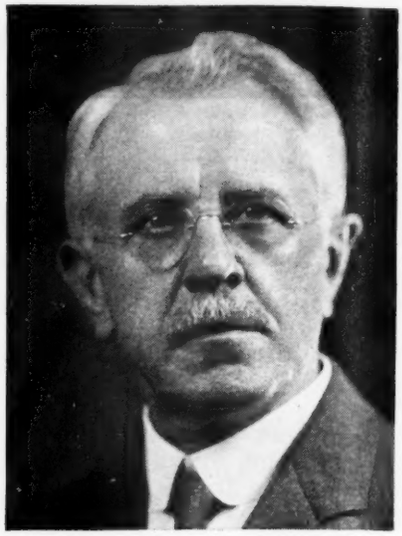
Philadelphia to Have an A.S.T.E. Chapter

PHILADELPHIA—The pre-organization committee of the Philadelphia Chapter of the American Society of Tool Engineers will hold its charter meeting at the Adelphia Hotel on Feb. 24. A reception at 6 p.m. will be followed by dinner. Conrad O. Hersam, consulting and designing engineer, made the announcement.

Foundrymen Nominate Marshall Post

CHICAGO — Nominating committee of the American Foundrymen's Association met on Feb. 10 and designated the following officers for one year: president, Marshall Post, vice-president, Birdsboro Steel Foundry & Machine Co.; vice-president, H. S. Washburn, president, Plainville Casting Co. Directors who will serve for three years are: Hyman Bornstein, director of research, Deere & Co.; F. A. Lorenz, Jr., vice-president, American Steel Foundries; D. O. Thomas, general manager, Saginaw Malleable Iron Division, General Motors Corp.; G. A. Seyler, works manager, Lunkenheimer Co., and H. S. Hersey, vice-president, C. O. Bartlett & Snow Co. Election will take place at the annual meeting of the association.

H. E. LEWIS



FRED L. EBERHARDT

PERSONALS

H. E. LEWIS, chairman of the board, Jones & Laughlin Steel Corp., has been elected president as well, to succeed S. E. HACKETT, who has resigned as president, director, and member of the executive committee. The Corporation also announced that LEWIS M. PARSONS had been elected a director and vice-president in charge of sales. Mr. Parsons was recently in charge of the Philadelphia sales office for the Bethlehem Steel Co. Mr. Parsons entered the employ of the Bethlehem Steel Company in 1919 and became assistant manager of sales in Philadelphia in 1932.

FRED L. EBERHARDT, president and general manager of Gould & Eberhardt, Irvington, N. J., will celebrate his 70th birthday at sea while enroute to the Leipzig Fair. He will be accompanied by W. F. ZIMMERMANN, chief engineer and works manager.

In 1881, Mr. Eberhardt started to work for his father at the age of thirteen, and thus has spent 57 years with the company. He has devoted his entire life to the advancement of machine tools, and was president of the National Machine Tool Builders Association from 1907-1909.

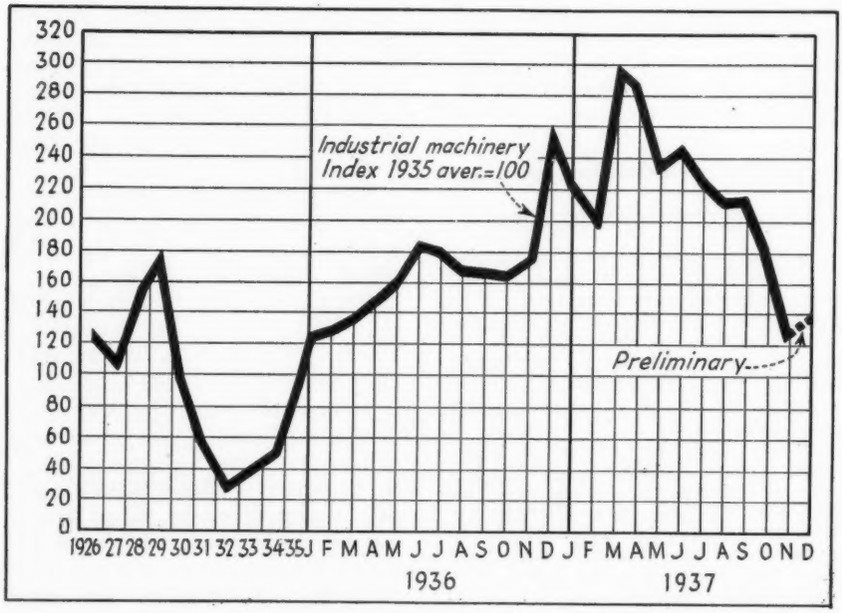
W. H. BEAL, with the Lycoming Aircraft Engine division since the World War, has been named president and ALBERT I. LODWICK was made executive vice-president of Aviation Mfg. Corp., a subsidiary of Aviation Corp.

A. E. GRAPP was re-elected president of the Despatch Oven Co., at the annual meeting of the board on Feb. 1. Other officers re-elected were: H. L. GRAPP, vice-president and general manager; C. P. DOHERTY, vice-president and production manager; G. C. KEYES, vice-president and chief engineer; and F. H. FABER, secretary and sales manager.

JOSEPH C. LANG, formerly works manager, Automatic Business Machines, Inc., Pittsburgh, manufacturers of the Robotyper, has resigned to become chief engineer with Brookle L. Jarrett & Co., industrial engineers, of the same city.

C. A. POWELL has been appointed manager of a new department that will centralize electrical engineering activities relating to industrial power problems, according to an announcement from the Westinghouse Electric & Mfg. Co. Mr. Powell, who was manager of the company's central station engineering department, will appoint three assistants.

HERBERT H. PEASE, president of the New Britain Machine Co., New Britain, Conn., was elected one of seven directors of the A. G. Spaulding & Brothers, manufacturers of sporting goods, when the board was reduced from fifteen to seven members.



Industrial Machinery Index Up

Thanks to improvement in export machine tool orders and in domestic electric motor sales in December this Index of Industrial Machinery Orders rose ten points.

ALLEN W. MORTON

ALLEN W. MORTON has been elected vice-president of the Koppers Co., and will continue in charge of Koppers' American Hammered Piston Ring Division at Baltimore, where he has been general manager. Mr. Morton was first employed at the Bartlett Hayward Co., now a division of Koppers, and then became associated with American Hammered.

N. B. ORNITZ will continue the management of the National Alloy Steel Div., Blaw-Knox Co., Pittsburgh, as well as taking up his new duties as president of the Power Piping Division. W. N. QUARTZ is now vice-president in charge of operations of the Power Piping Division.

HARRY W. ELLIS has relinquished the post of president and general manager of the Johnson Service Co., Milwaukee, manufacturer of temperature control systems, to become chairman of the board. Mr. Ellis is succeeded by J. A. CUTLER, who was vice-president and sales manager.

CHARLES B. PATT has been made superintendent of the Allentown, Pa., works of the American Steel & Wire Co. He was previously assistant superintendent of the Donora, Pa., works.

C. C. WOMACK has been made plant industrial engineer of the Irvin Works, Carnegie-Illinois Steel Co. E. A. DAVIS has been appointed to a similar post at the Wood Works.

DR. ROBERT E. DOHERTY, president, Carnegie Institute of Technology, Pittsburgh, has been awarded the 1937 Lamme Medal of the American Institute of Electrical Engineers, "for his extension of the theory of alternating current machinery, his skill in introducing that theory into practice, and his encouragement of young men to aspire to excellence in this field." The medal and certificate will be presented to him at the annual summer convention of the Institute in Washington.

PAUL C. POCOCK, sales manager of the Hydraulic Press Mfg. Co. sailed on the *Queen Mary* for a several weeks trip to England and the Continent where he will visit users of H-P-M presses and secure distributors.

C. W. McMULLEN

C. W. MCMULLEN, assistant chief inspector, Frigidaire Div., General Motors Corp., has been promoted to manager, standards division, according to an announcement by E. G. BIECHLER, general manager. Mr. McMullen succeeds HARRY M. WILLIAMS, who resigned to become director of research, National Cash Register Co.

C. W. HEPPENSTALL, president and treasurer of the Heppenstall Co., Pittsburgh, who has spent 45 continuous years with the firm, was honored by 600 employees on Feb. 13. Mr. Heppenstall is the fourth generation of the family to work in steel plants of England and America. He and his brother, SAMUEL D. HEPPENSTALL, vice-president, have five sons, all of whom work for the company.

L. C. KING, who was associated with the late J. B. STRONG, former New England representative for the Fellows Gear Shaper Co., who died recently, (AM—Vol. 82, page 80h) has been appointed to represent the Fellows Gear Shaper Co. in the New England territory.

VICTOR R. WILLOUGHBY, general mechanical engineer of the American Car & Foundry Co., since 1924, has been elected vice-president in charge of engineering, a new office. CHARLES J. HARDY, president of the company, made the announcement. E. D. CAMPBELL, assistant general mechanical engineer at Berwick since 1933 will succeed Mr. Willoughby as general mechanical engineer. He will be succeeded as assistant general mechanical engineer at Berwick by W. F. DIETRICHSON.

H. OTTO VOGT, formerly a director, was elected president of the Gray Telephone Pay Station Co., Hartford, Conn., Feb. 9. He succeeds GEORGE A. LONG. Other officers are: vice-president, FRANKLIN H. ARNOLD; secretary-treasurer, LEICESTER H. LANCASTER.

A. BAIR BASSOFF has been appointed manager of the Atlantic Gear Works, New York. He was formerly consulting engineer for the Sier Bath Co. RICHARD BEERS has been named works superintendent, and C. DAHLERUP continues as general superintendent.

OBITUARIES

HOWARD R. BEMIS, 70, president of Bemis & Call Co., tool manufacturers, Springfield, Mass., and a member of the board of directors, Fiberloid Corp. shot and killed himself on Feb. 2.

BENNETT M. BRIGMAN, dean and organizer of the Speed Scientific School, University of Louisville, died Feb. 8 at the age of 56. Mr. Brigman had been elected vice-president of the American Society of Mechanical Engineers and had served for years on that organization's examining and accrediting board.

FRANK COLLINS

FRANK COLLINS, 67, executive vice-president of the National Supply Co., and president of the Toledo Pipe Threading Machine Co., died Feb. 12 after a lingering illness.

HAROLD H. EAGER, president and general manager of the Dominion Twist Drill Co., Ltd., died at Windsor, Ont., on Feb. 15 from a heart attack.

HERBERT C. LINDSLEY, 64, formerly superintendent of the McCaskey Register Co., Alliance, Ohio, died Feb. 2. Mr. Lindsley left McCaskey Register after having been identified with it for 20 years to join the States Metal Co., Aliquippa, Pa., four months ago, as shipping supervisor.

ROMEO A. GISE, 50, engineer of the Russell & Erwin Division of the American Hardware Corp., New Britain, Conn., died Feb. 4 after a long illness. Mr. Gise began with the Stanley Works, but had been plant engineer of the Russell & Erwin Division for 21 years.

HERBERT A. WAGNER, 71, who retired in 1932 as sales manager, bolt and nut products division, Bethlehem Steel Co., died recently.

ELZA H. REITER, 79, Elgin, Ill., manufacturer and inventor of boiler-cleaning devices died recently.

JAMES W. WIER, president and treasurer of the Housatonic Machine & Tool Co., Bridgeport, Conn., died recently.

EMIL N. JOHNSON, 44, president and general manager of the Jamestown Steel Partitions Co., Inc., Jamestown, N. Y., died suddenly Feb. 4.

JAMES RUSHWORTH, 66, for several years an official of the Aurora Tool Manufacturing Co., Aurora, Ind., died recently.

LEO O. SMITH, president and treasurer, Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y., died of pneumonia on Feb. 7. He was 53 years old.

CHARLES SCHOFIELD, president of William Schofield Co., Manayunk, Pa., textile machinery manufacturer, died after a short illness at the age of 76.

EDWIN P. ROOT, former president of the New Haven Clock Co., and chairman of the board of directors, died Feb. 7 at the age of 76.

CHARLES K. WEISS, superintendent, Thatcher Furnace Co., Garwood, N. J., died at the age of 59.

BUSINESS ITEMS

The Cimatool Co., Dayton, is building a new plant on the 19-acre tract acquired last July along Springfield and Irwin Sts. in order to provide increased facilities for its tool and die business with the automotive, refrigerator and metal industries. Cimatool also makes a standard line of gear-tooth chamfering and burnishing machines, precision boring machines and special machinery. When Cimatool vacates its present plant it will be occupied by its associated company Sheffield Gage Corp., thereby affording Sheffield increased facilities to handle increasing business.

Control of Bemis & Call Co., Springfield, Mass., passed into the hands of PORTER CHASE, president of the Sesamee Co., Hartford, maker of locks, and HOWARD A. LINCOLN, general manager of Bemis & Call for the past three years.

Ludlum Steel Co., Watervliet, N. Y., has appointed GERALD D. HOWK as mill representative in the Cincinnati territory, with offices with Julius Uihlein & Co., 208 Elm St., which he will assist in servicing Ludlum products they handle, as well as other Ludlum products not so covered.

Black & Decker Mfg. Co., Towson, Md., has opened a branch factory service branch at 630 Baronne St., New Orleans.

The A. F. Holden Co., New Haven, Conn., has appointed J. B. CAREY, formerly chief metallurgist, New Process Gear Corp., Syracuse, as representative in Northern Illinois, Wisconsin, Iowa, and Minnesota.

George Scherr Co., 128 Lafayette St., New York, opened a branch Chicago sales office at 565 West Washington Blvd., in charge of JOHN M. GRAVEN. A permanent exhibit of measuring and inspection equipment is connected with the new office.

J. S. NACHTMAN

The Blaw-Knox Co. has announced its entrance into the production of equipment for the electro-tinning of steel as well as other continuous electroplating processes through the acquisition of the Electrochemical Processes Co., Youngstown, Ohio. The company will be operated as the Electrochemical Processes Division, and J. S. NACHTMAN, president, will be in charge of the new division with offices at Groveton, Pa., P. O. Box 1586, Pittsburgh.

The new division will also produce equipment for continuously plating tin, nickel, brass, bronze, terne plate, copper on steel, and for the continuous cleaning and pickling of sheet, strip and wire, including rust-proofing and coloring.

Peter A. Frasse & Co., Inc., steel distributor, has appointed T. W. HAGER as vice-president, to act as assistant to the president, LESTER BRION, in the general management of the company. A. B. MEAD, formerly vice-president and manager at Philadelphia, has been transferred to New York, and will be vice-president and manager of sales. V. HANSEL will be assistant manager of New York sales. J. W. PATRICK, JR., becomes Philadelphia sales manager.

Chicago Molded Products Corp., 2145 W. Walnut St., Chicago, has purchased a plot of approximately 100,000 sq. ft. at N. Kolmar Ave. and Augusta St., with intention to build a one- and two-story plant costing approximately $160,000.

The R. K. LeBlond Machine Tool Co., has appointed the Weatherby Machinery Co., 1719 First Ave. South, Seattle, Wash., as agents for its complete line of lathe and cutter grinders. Weatherby has also taken over the line of the Niles Tool Works Division General Machinery Corp., Hamilton, Ohio.

Tool Equipment Sales Co. is moving to larger quarters at 24 South Pulaski Road, Chicago, Ill.

The Indianapolis plant of the American Can Co. will have a large addition, according to plans outlined before the city board of public works.

South Bend Air Products, Inc., South Bend, Ind., was recently organized to purchase and continue the centilating equipment business formerly conducted by the Industrial Fan Division, Bendix Products Corp.

Houser Engineering & Manufacturing, Inc., 117 Main St., Bluffton, Ind., has been formed to manufacture automobile equipment.

The Pioneer Engineering & Manufacturing Co., 31 Melbourne Ave., Detroit, manufacturers of positive-displacement coolant and lubricant pumps, has appointed the Willis J. Stutson Co., 184 N. Wacker Drive, Chicago, as exclusive representative in the Chicago and Northern Illinois district.

Chicago-Latrobe Twist Drill Works has announced the election of HARVEY B. BOWER as vice-president in charge of its newly opened Milwaukee branch office and stockroom at 910 North Fourth St. The company has also opened a Pittsburgh branch at 20 Penn Ave., in charge of CLARENCE W. KRUEGER, vice-president.

Bunting Brass & Bronze Co. has appointed WILLIAM C. BRACKEN to its sales staff, with headquarters at the branch sales offices and warehouse at 296 Ivy St., N. E., Atlanta. The company is consolidating its automotive and industrial products warehouses in Los Angeles at 240 W. 18th St., where operations will be under I. ELDRED, formerly in charge of the Kansas City offices. ALLAN HASTY of the Toledo office will replace Mr. Eldred in Kansas City.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Twenty-second annual meeting, April 25-27. General Brock Hotel, Niagara Falls, Canada. J. C. MCQUISTON, manager-secretary, Penn-Lincoln Hotel, Wilkinsburg, Pa.

AMERICAN MANAGEMENT ASSOCIATION. Eighth packaging exposition, March 22-25, Palmer House, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, March 23-25. Los Angeles, Calif.

AMERICAN SOCIETY OF TOOL ENGINEERS. Machine and Tool Progress Exposition, March 9-12. Detroit Convention Hall. FORD R. LAMB, executive secretary, 5928 Second Blvd., Detroit.

AMERICAN SOCIETY FOR METALS. Western Metal Congress. Week of March 21, Los Angeles, Calif.

AMERICAN SOCIETY FOR TESTING MATERIALS. Regional meeting, March 7-11. Rochester, N. Y.

AUTOMOTIVE ACCESSORY MFRS. ASSOC. Eleventh annual exposition, Feb. 28-Mar. 1. Port Authority Bldg., New York.

NATIONAL RAILWAY APPLIANCES ASSOCIATION. March 14-17, Palmer House, Chicago.

SOCIETY OF AUTOMOTIVE ENGINEERS. National passenger car meeting, March 28-30. Hotel Statler, Detroit.

SHOP EQUIPMENT NEWS

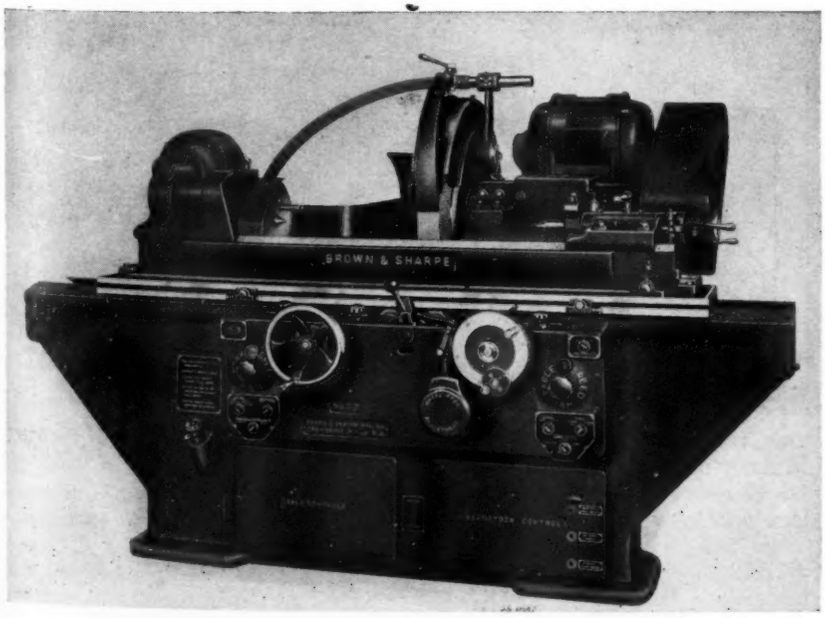
Brown & Sharpe "20 Series" Plain Cylindrical Grinders

Entirely electrically controlled, the "20 Series" plain cylindrical grinders announced by Brown & Sharpe Mfg. Co., Providence, R. I., are compact, self-contained units designed for the grinding of medium-large parts on a production basis. All operating functions of major units are governed by simple manipulation of various selector switches and control knobs, which are grouped at the front within easy reach from the operating position. Once the machine has been set up for a given job, it can be controlled entirely by the cross-feed handwheel. Turning one selector switch provides this semi-automatic grinding cycle, whereby a slight rotation of the cross-feed handwheel advances the wheel to the work, and simultaneously starts the headstock, the table, cross feed and coolant pump. When the work is "to size", the cross feed automatically is disengaged and rotation of the handwheel to the starting position withdraws the wheel and stops the headstock, table and coolant pump.

Two control knobs provide for manual operation. Turning the table knob starts and stops the table; and, when desired, pressing down the knob will cause the table to stop at the end of its path of travel. The headstock knob starts and stops the headstock and coolant pump together; and, by turning a selector switch, this knob also can be made to start and stop the table movement. When it is desired to inspect the work being ground, depressing the headstock knob will stop the flow of coolant without affecting the headstock rotation. The same control can be used to jog or rotate the headstock slightly.

Other electrical features include table dwell, adjustable from zero to 1½ sec.; electrical braking and reversal of the table motor; individual motor drive for wheel spindle, headstock, table, oil pump and coolant pump; and the simplification and safety of operation obtained by interconnection of control circuits.

The No. 20 machine is of 10 x 18 in. capacity, with a maximum swing of 10¾ in. over the table. A 24-in. wheel clears work to 10-in. diameter. The No. 22 unit, shown in the accompanying illustration, is an identical machine except that it has a longer bed and table and takes work to 36-in. between centers. These machines are furnished either for a.c. or d.c. power supply and require approximately 18 hp. for operation at maximum capacity.



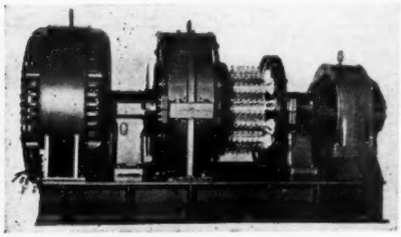
Headstock speeds range from 80 to 320 r.p.m. and rates of table travel are in two ranges, 15 to 60 in. and 75 to 300 in. per min. In addition, extra-slow rates of table travel of 7 and 11 in. per min. are provided. Wheel spindle is driven by multiple V-belt from a motor mounted on the wheel slide. Change sheaves give spindle speeds of 825 and 1,035 r.p.m. Mechanical features include adjustment of cross feed throwout to 0.0001 in., either manually or automatically. Automatic lubrication is provided for the wheel spindle, wheel slide ways, cross feed and table mechanisms. These machines can be furnished equipped with a revolving spindle headstock, a low range of work speeds (46 to 185 r.p.m.) and a wheel spindle reciprocating arrangement.

H.-V.W.-M. Special Plating Generator

Designed for use in the anodic treatment of aluminum parts, this low-voltage generator set offered by Hanson-Van Winkle-Munning Co., Matawan, N. J., has automatic voltage control. This control will vary generator voltage through a predetermined cycle of value as required for the specified treatment of a batch of parts. Normal rating of the generator is 1,500 amp. at 50 volts on the basis of continuous operation. It has a 125 hp., 600 r.p.m., unity-power-factor synchronous motor directly mounted on one end of the generator shaft and a 125 volt exciter mounted on the opposite end of the shaft.

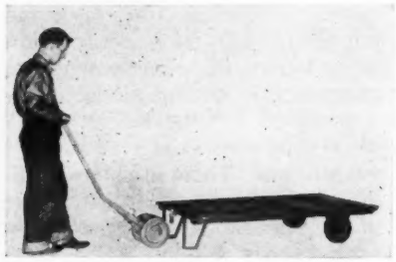
Generator control panel includes regular indicating instruments and equipment for manual as well as

automatic control. The automatic control consists essentially of a motor-driven field rheostat and timer, together with a graphic recording ammeter and voltmeter. Auxiliary equipment includes overload and reverse current relay and indicating and signalling devices.



Barrett "Jackit" Hand Truck

Semi-live skids are used in connection with the "Lift-Jack" mechanism to form the "Jackit" hand truck offered by Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill. Skids are steel bound and have hard maple top boards. Wheels are equipped with Hyatt roller bearings and are fitted with Alemite grease cups. Both in

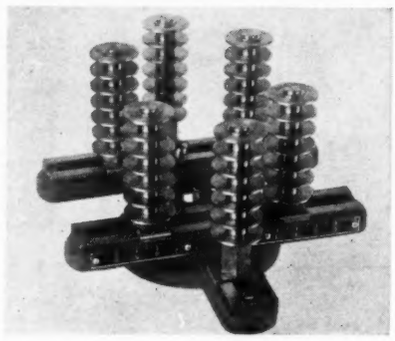


raising and lowering loads with the "Lift-Jack," a positive-type latch eliminates hazards. A spring handle hold-up keeps the handle off the floor when not in use.

Fifteen sizes of skids, in two capacities and with various superstructures, are available to meet individual requirements. Skid sizes range from 24 x 36 to 36 x 72 in. with either $\frac{7}{8}$ or $1\frac{1}{8}$ in. tops. Wheels can be either chilled-iron or rubber tired. Weight of the "Lift-Jack" is 64 lb. and it is 48 in. long over-all.

"Midget" Winding Head for Small Coils

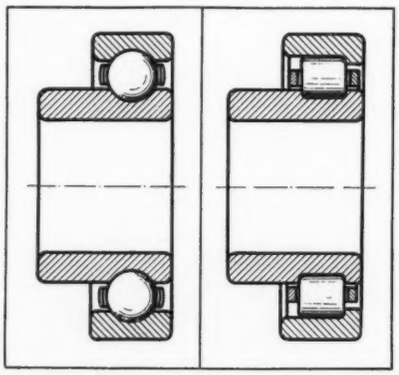
Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill., offers the "Midget" coil winding head for making coils ranging from $1\frac{3}{4}$ x 4 in. to $8\frac{1}{2}$ x 6 in. This head can be mounted and used on the faceplate of any lathe having a 12-in. swing or larger, or on any other turning device. Flexibility and ease of ad-



justment are claimed for this unit, which consists of a machined base for mounting on the faceplate of a lathe or coil winder drive, with two cross arms to insure accurate setting of the spindles. There are six spaces on the spindles for coils and the open construction permits the operator to wind all six coils in series, thereby eliminating the necessity of soldering and taping joints between coils. Coils may be taped and tied together, ready to be placed in the armature or stator slots, before they are removed from the head.

Norma-Hoffmann Precision Bearings

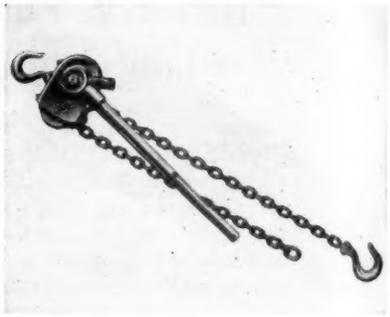
WIR Series ball bearings and WIR-L Series roller bearings, announced by Norma-Hoffmann Bearings Corp., Stamford, Conn., feature a wide inner ring of double-row bearing width in combination with an outer ring of single-row width. These bearings have been designed primarily for opposed mounting in electric motors and similar equipment. The wide inner ring is said to insure better sealing on the shaft



than the standard single-row ring. In many cases it avoids the necessity for threading the shaft and applying lock nuts or other locking devices. Ball bearings of this type are available with from 25 to 55 mm. bore, while the roller bearings with one-lipped outer ring are available with from 30 to 130 mm. bore.

Harrington "Cum Along" Hoist and Puller

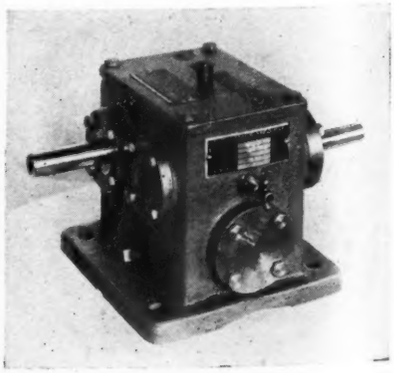
Made in two sizes, of $\frac{3}{4}$ and $1\frac{1}{2}$-ton capacities, the "Cum Along" ball bearing lever hoist and puller, announced by The Harrington Co., 17th and Callowhill Sts., Philadelphia, Pa., can be used in any position. This unit is claimed to hold the load at any



point and to lower smoothly and easily. Chain is of electrically welded high-carbon steel, heat-treated for increased strength. Handle movement can be as little as 30 deg., or as much as a full circle. A pawl in the handle can be reversed to change direction of hook travel. Regular pull is 5 ft. for either unit, but this can be increased by increasing the chain length. Net weight of the small unit is 20 lb., and 32 lb. for the $1\frac{1}{2}$-ton unit.

James Double-Type Worm-Gear Reducers

Three additional sizes of double-type, worm-gear reducers are offered by D. O. James Mfg. Co., 1114 W. Monroe St., Chicago, Ill. These units have a range of speed ratios from



30 to 3,600 to 1, and have torque capacities at the slow speed shaft from 40 to 400 in. lb. These reducers consist of two bronze worm gears and steel worms mounted in Timken tapered roller bearings, giving a light drive with high ratios.

Here's the Answer to Your PRODUCTION DRILLING JOBS!

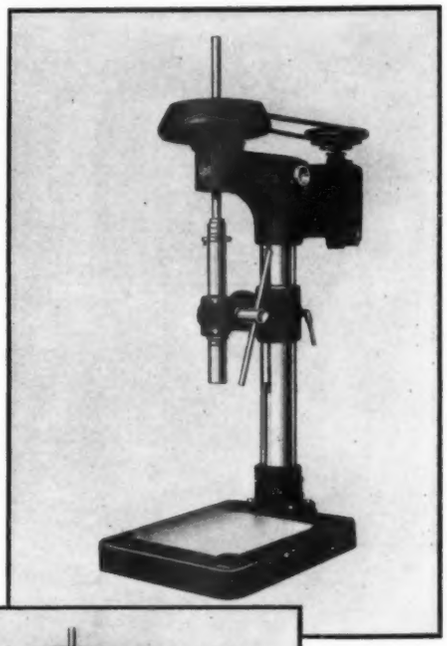
• • • "Buffalo" No. 16 SENSITIVE DRILLS

● These better drills were designed to fit your production drilling needs. They are thoroughly modern in every detail: V-Belt positive drive, 4 speeds, spindles rigidly supported for accuracy at any speed or pressure, 3 styles (each illustrated).

If you are considering the purchase of drills, you should be sure to get all the facts on "Buffalo" No. 16. Ask for Bulletin 2730-C.

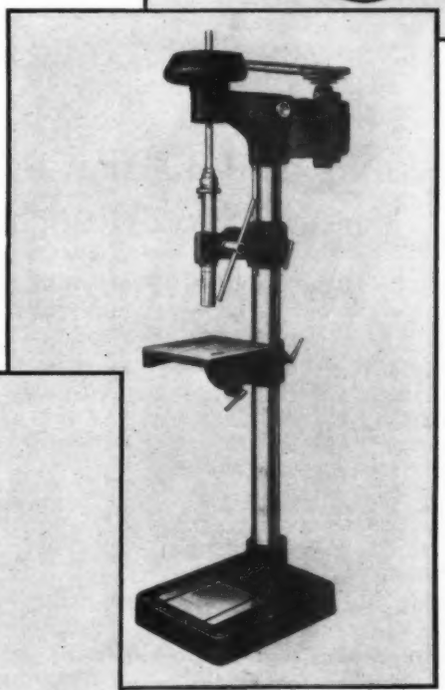
BUFFALO FORGE COMPANY
448 BROADWAY BUFFALO, N. Y.

Branch Engineering Offices in Principal Cities
In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



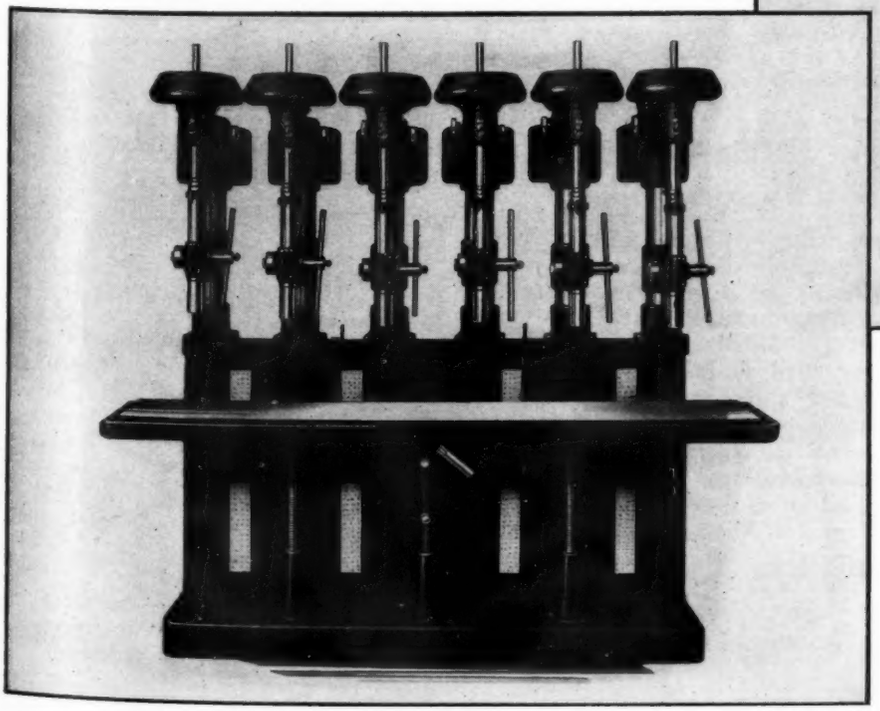
BENCH TYPE

Single spindle, full ball-bearing. Built in 1, 2, 3, and 4 spindle units



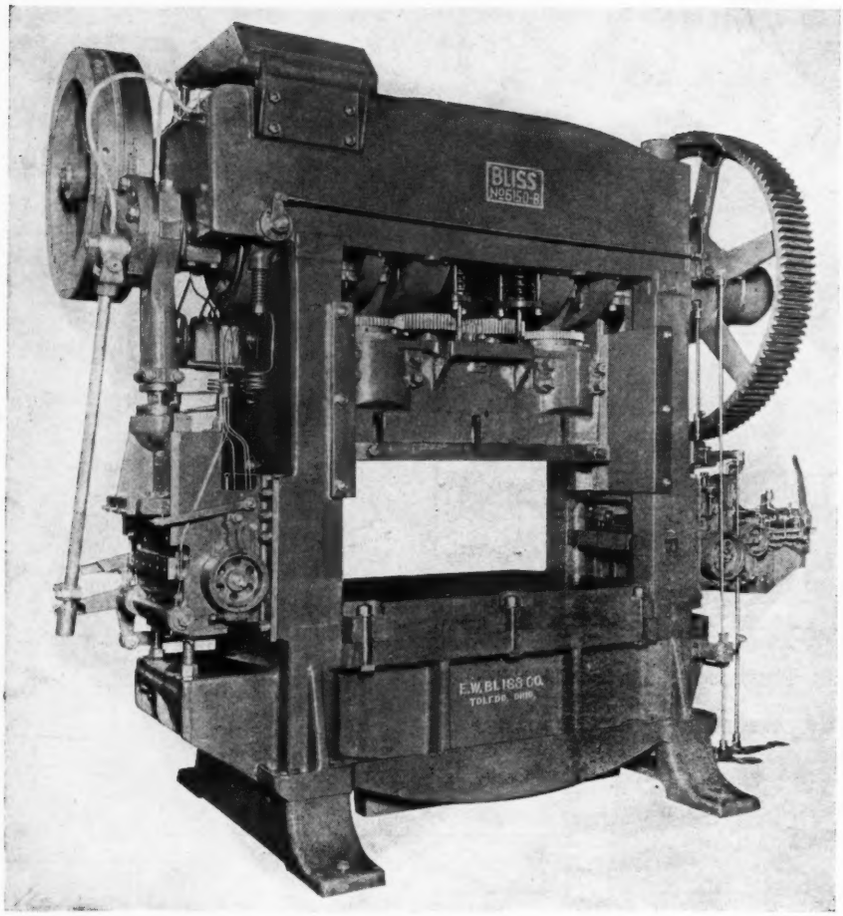
ROUND COLUMN FLOOR TYPE

Has combination square table with machined skirt on one side. May be swung aside for extra long work if necessary. Note machined base.



MULTIPLE SPINDLE PEDESTAL TYPE

All spindles directly and rigidly supported on straight-sided pedestals. Tables are close grained cast iron.



Bliss No. 6150-B "High-Production" Variable-Speed Punch Press

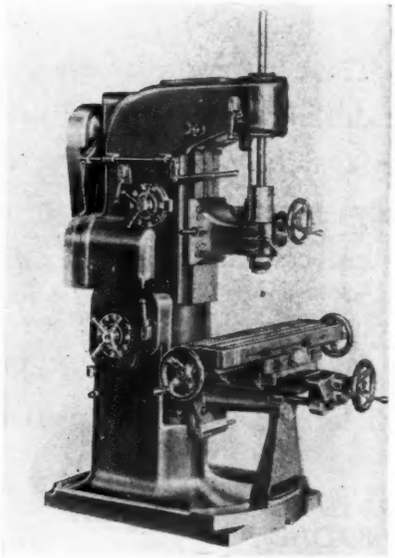
The No. 6150-B "High-Production" 190-ton press, announced by E. W. Bliss Co., 53rd St. & Second Ave., Brooklyn, N. Y., is arranged to operate at 30, 35 and 60 strokes per min. when driven by a 15 hp. multiple-speed motor through V-belts to the flywheel. Higher speeds can be obtained through the use of other drive arrangements. Distance between uprights to clear is 60 in., while the bed area is 36 x 60 in. Crankshaft is of the double eccentric type. A 18½-in. wide, heavy-duty precision type double roll feed is used on this press. It is adjustable for any feed length from 0 to 15 in. per stroke. Combined with the feed is a seven-roll, power-driven straightener and a shear-type scrap cutter that can be adjusted for cutting clearance.

Clutch is of the long hook, rolling key type with a full length locking pawl and a releasing brake. Main and crankpin bearings are bronze bushed while the driveshaft runs in Timken roller bearings. An automatic four-speed system porvides lubrication to all the main bearings. Frame is of tierod construction. Conservative rating of the press for fine dies is 150-ton. Specifications: diameter of crankshaft at bearings, 6½ in.; stroke of slide, 4 in.; shut height on bed, 24 in.; thickness of bolster, 6 in.; area slide, front to back by right to left, 20 x 51½ in.

Knight No. 30 Vertical Miller

Featuring a tilted table which also swivels around the column for special set ups, the No. 30 universal vertical milling machine offered by W. B. Knight Machinery Co., 3920 West Pine Blvd., St. Louis, Mo., has a short V-belt drive through a twin-disk clutch to the spindle. Vertical adjustments are obtained by moving the counter-balanced spindle and spindle head rather than the table unit. The forged chrome-nickel steel spindle is driven by hardened, ground and lapped spiral-bevel gears. Table may be kept square with spindle by means of an easily adjusted eccentric bushing in the outer table support. Swiveling the table around the column permits machining at one setting work that is longer than the travel of the table and, also, increases the throat capacity of the machine.

Specifications: longitudinal power feed for table, 25 in.; transverse power feed for table, 12 in.; maximum distance from table to spindle, including adapter, 20 in.; minimum distance from table to spindle, including adapter, 0 in.; distance from face of column to center of spindle, 12 in.; travel of spindle head on column, 14 in.; travel of spindle in head, 6½ in.; working surface of table, 10 x 42 in.; distance from floor to top of table, 33 in.; number of spindle speeds, 16; range of spindle



speeds, 80 to 1,600; number of table feeds, 16; range of table feeds, ½ to 12¾ in.; number of vertical spindle feeds, 4; range of vertical spindle feeds, 0.002 to 0.010 in.; maximum length of power vertical spindle feed, 6 in.; motor required, 3 hp.; net weight, with regular equipment, 4,000 lb.; floor space required, 70 x 86 in.; height of machine, 100 in.

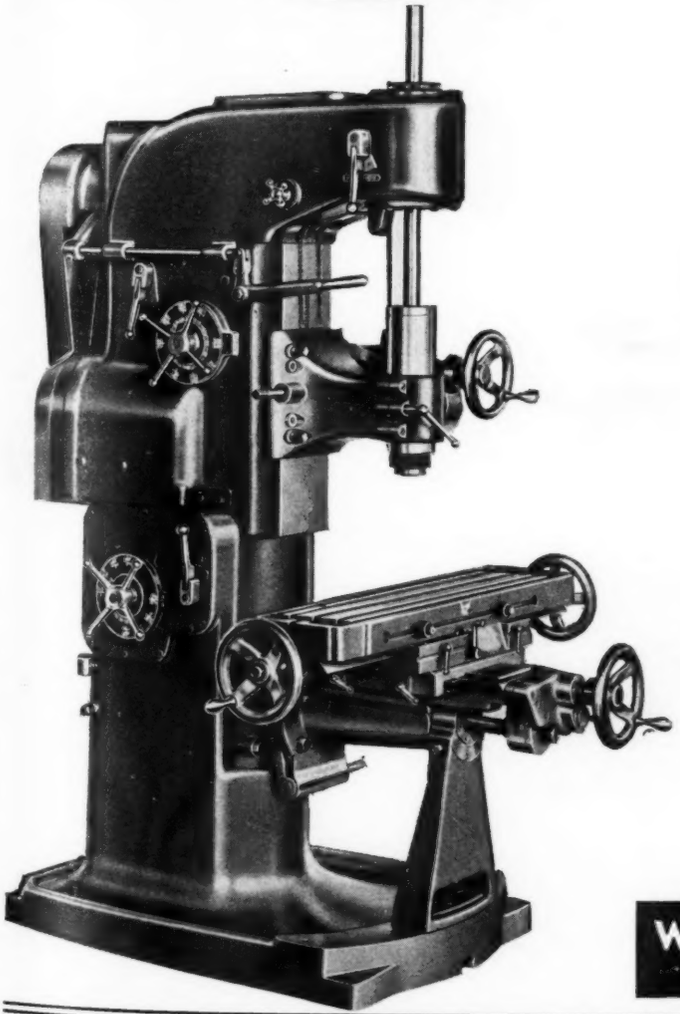
S-C "Dry Cyaniding" Case-Hardening Process

A continuous case hardening process known as "Dry Cyaniding" has been developed by Surface Combustion Corp., Toledo, Ohio. This process is a combination of continuous nitriding and continuous gas carburizing. It produces a case that is said to be similar to a cyanide case in many respects.

Unlike cyaniding, this process is carried out in a gaseous atmosphere which is a combination of carburizing gases and ammonia. A variety of gases and ammonia may be used to

THE KNIGHT MILLER

It's Sweet Music TO ANY BOSS



BETTER OPERATORS

here's •••• *one reason why*

The ease and convenience of getting adjustments on the Knight Miller saves work and time for the operator and wear on the Miller. All vertical adjustments are simply obtained by moving the counter-balanced spindle and spindle head rather than a heavy table unit. For other reasons why your operators can do better work with a Knight Miller, write us.

GREATER SPEED

here's •••• *one reason why*

The short time required to make setups, particularly difficult ones, combined with the elimination of additional setups or at least, if necessary, the simplification of additional ones, means greater speed in turning out good work. But there are other reasons why the Knight Miller gives you greater speed and they are worth writing for.

MORE PROFITS

here's •••• *one reason why*

While perfectly capable of doing a wide range of ordinary plain milling and boring, the big profit-making advantages of the Knight Miller is its ability to quickly and accurately machine difficult and unusual parts without special equipment. We can tell you other ways the Knight Miller can save money for you—write!

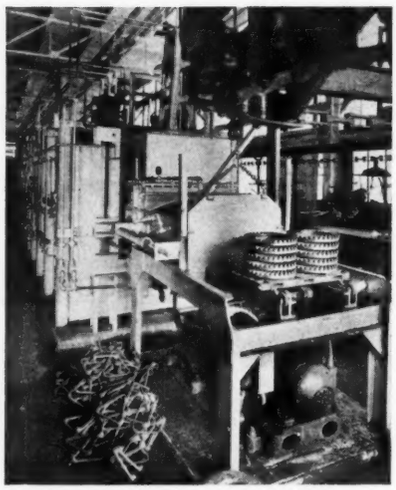
★ The value of a Knight Miller as a profit-producing investment has been proved in the plants of many leading manufacturers. Investigate the profit value of the Knight Miller as applied to your needs.

KNIGHT VERSATILE MILLERS ACCURATE - RIGID

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

produce a case with any desirable concentrations of carbides and nitrides ranging from a few thousands of an inch to any desirable case depth.

Equipment necessary for dry cyaniding is similar in many respects to that used for continuous gas carburizing, as is shown. Work is loaded on trays and pushed through a muffle furnace in a continuous cycle. Atmosphere seals at both ends of the furnace prevent infiltration of air. Work upon emerging from the furnace is clean and no brushing is required. Process is continuous and furnace may be placed in a production line. Case secured is uniform.

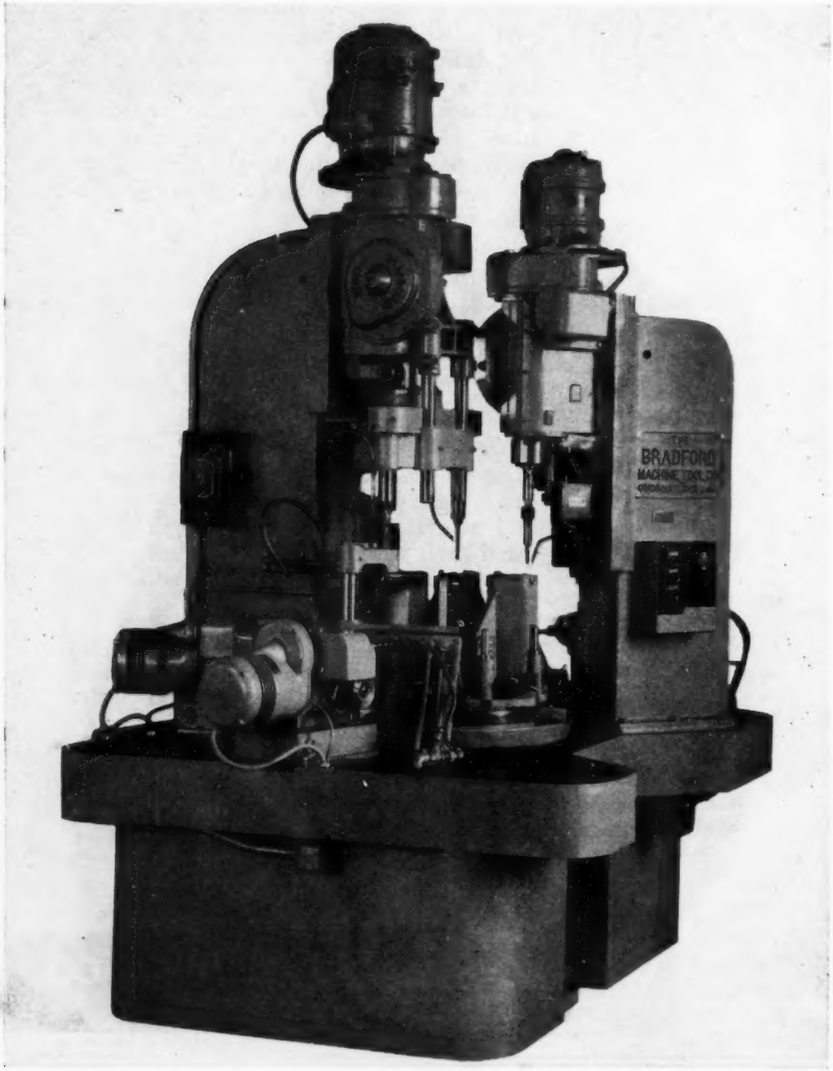


Bradford Special Drilling Machine

This special drilling, reaming and tapping unit has been developed by the Bradford Machine Tool Co., 657 Evans St., Cincinnati, Ohio, for machining automobile steering knuckle arms, such as are used in "knee action" or independent front-wheel suspension type mountings. Machine simultaneously handles both right and left hand arms, producing alternately rights and lefts. It is principally of welded steel construction and consists essentially of a large box-type base with built-in coolant reservoir, supporting six automatic drilling units grouped about a six station horizontal indexing fixture which is used for holding twelve pieces.

The four horizontal units drill at three stations and ream at the final station, while the vertical operations are handled by two units, the larger having three spindles and drilling at two stations while counterboring at the third. The smaller, single-spindle vertical unit has a reversing motor for tapping. Control of the machine is fully electrical by means of pushbuttons, limit switches, solenoids and magnetic contractors. All of the electric equipment and wiring are built into the machine. Operator's control is centered in the pushbutton station mounted on the column near his right hand.

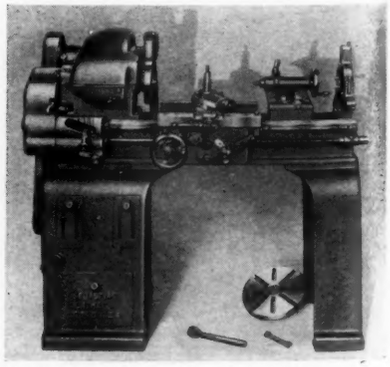
Approximately 150 parts per hour are produced in the following sequence of operations: (1) load and unload, (2) idle, (3) drill $\frac{23}{64}$ hole one-third through and drill $\frac{13}{32}$ hole halfway through, (4) drill $\frac{23}{64}$ hole two-thirds through and finish $\frac{13}{32}$ hole, (5) finish drill $\frac{23}{64}$ hole and drill $\frac{3}{8}$ tap hole, (6) ream $\frac{23}{64}$ hole to 0.375 in. and tap $\frac{3}{8}$-24 hole.



Sebastian "Stremeline" Improved Lathes

All moving parts of the "Stremeline" lathes offered by The Sebastian Lathe Co., Cincinnati, Ohio are guarded to protect the operator. These lathes are built in 10, 12 and 13-in. swing sizes, all with underneath motor drive. Lifting the belt guard on the headstock breaks a contact switch which automatically breaks the electric current and, also, releases the tension of the cone belt, permitting easy change from one step to another.

Specifications: swing over bed for 10-in. lathe, $10\frac{1}{4}$ in.; swing over carriage with chip guard removed, $6\frac{5}{8}$-in.; distance between centers with tailstock flush, 11 in. for the 3 ft. bed length; maximum length of bed,



TOPS *in* SPEED, ACCURACY, *and* ADAPTABILITY

OSTER THREADING EQUIPMENT WILLIAMS

Designed and engineered from the base up to be the all-star performers in their field, Rapiduction Bolt Threaders of the "900" series are proving their superiority wherever installed. Built in two sizes, 3/8" to 1 1/2" and 1/2" to 2 1/4", in double and single spindle designs, these machines not only handle all standard jobs but, because vise and carriage are free from obstructions, are particularly adapted for the application of special fixtures for holding unusual jobs.

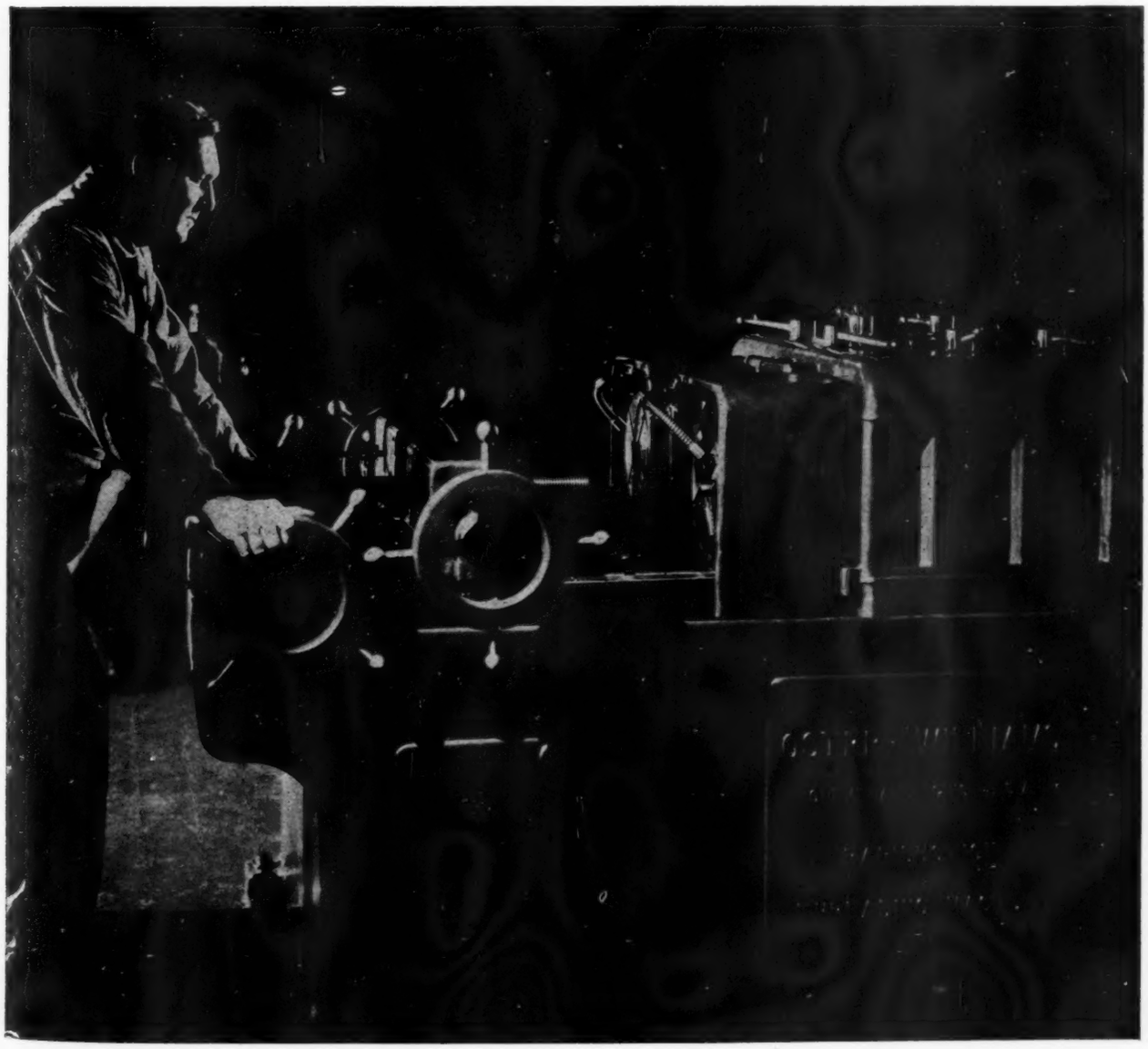
Write today for special bulletin.

THE OSTER MANUFACTURING COMPANY

Sales Office: 2049 East 61st Street, Cleveland, Ohio
Factories: Erie, Penna., and Cleveland, Ohio
New York City Showroom and Office, 292 Lafayette St.
Philadelphia Showroom and Office, 111 No. 3rd St.

Threading Headquarters Since 1893

RAPIDUCTION BOLT THREADER

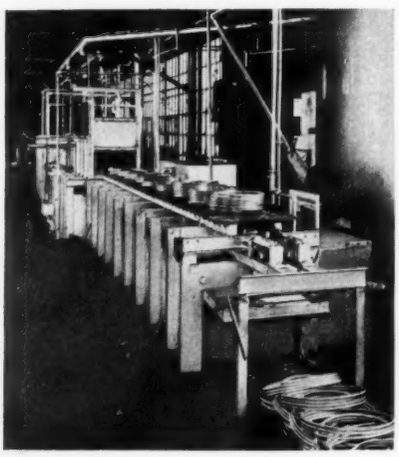


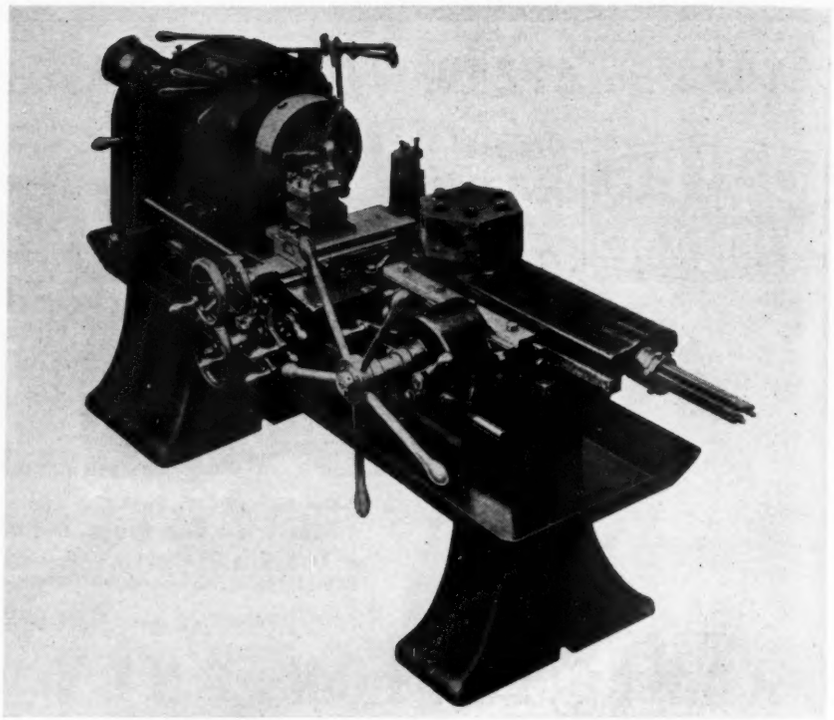
8 ft., (10 ft. for the 13-in. machine); hole through spindle, $1\frac{5}{16}$ in.; thread range, 3-384; feed range, 0.00175-0.111 in.; number of thread and speed changes, 180; compound rest travel, 2 in.; tailstock spindle traverse, $3\frac{3}{8}$ in.; tailstock set-over, $\frac{3}{4}$ in.; number of spindle speeds of cone-head machine, 6; range of spindle speeds of cone-head machine, 14-570.

Bellevue Furnace For Bright-Annealing

A bright-annealing furnace for copper tubes has been developed and constructed by Bellevue Industrial Furnace Co., 2971 Bellevue Ave., Detroit, Mich., for installation at the plant of the Roberts Tube Works in Detroit. This furnace can be described as a U-shaped double-deck furnace through which the material is carried on alloy trays which are pushed along by the chain and hook system. When the material has been placed on the charging platform on the upper deck, the trays are pushed into the first of the four sections of the furnace, a non-heated dead end, into which the specially prepared atmosphere has been introduced under sufficient pressure to create air locks which will prevent infiltration of the outside air.

Loaded trays are pushed forward from the first to the second section, and elevator compartment in which the batch of trays descends to the lower deck by the use of an automatically driven worm arrangement. From here the trays enter the third section, a heating zone in which the alloy muffle protects the material from direct contact with the products of combustion from the fuel used in the heating process. The last section is a cooling chamber in which the material is cooled to approximately 150 F., a temperature sufficiently low to exclude any possibility of oxidation when the trays emerge to the unloading platform at the end of the cycle.





Millholland No. 4 Universal Bar and Chucking Turret Lathe

Larger and heavier than the No. 4-H turret lathe previously described (*AM*—Vol. 81, page 422), the No. 4 universal turret lathe announced by Millholland Sales and Machine Co., 1115 E. 35th St., Indianapolis, Ind., has a universal carriage with six feed changes in the apron and six feed changes in the apron of the turret slide. Maximum power capacity is $1\frac{3}{4}$ in. round stock and 18-in. swing for chucking. Spindle is mounted in double-row precision Timken roller bearings at the front and a large diameter precision ball bearing at the back. Drive shafts are mounted in ball bearings. Headstock has twelve speeds forward and reverse, with automatic spindle brake.

Automatic chuck and bar feed are operated by a long lever at the front of the bed. With one movement, the operator opens the automatic chuck and feeds the bar. Reverse movement closes the chuck. A stepped wedge, operating the chuck closing fingers, automatically compensates for slightly varying diameters of work. Automatic chuck has a master collet in which may be attached collet bushings for different sizes and shapes of stock.

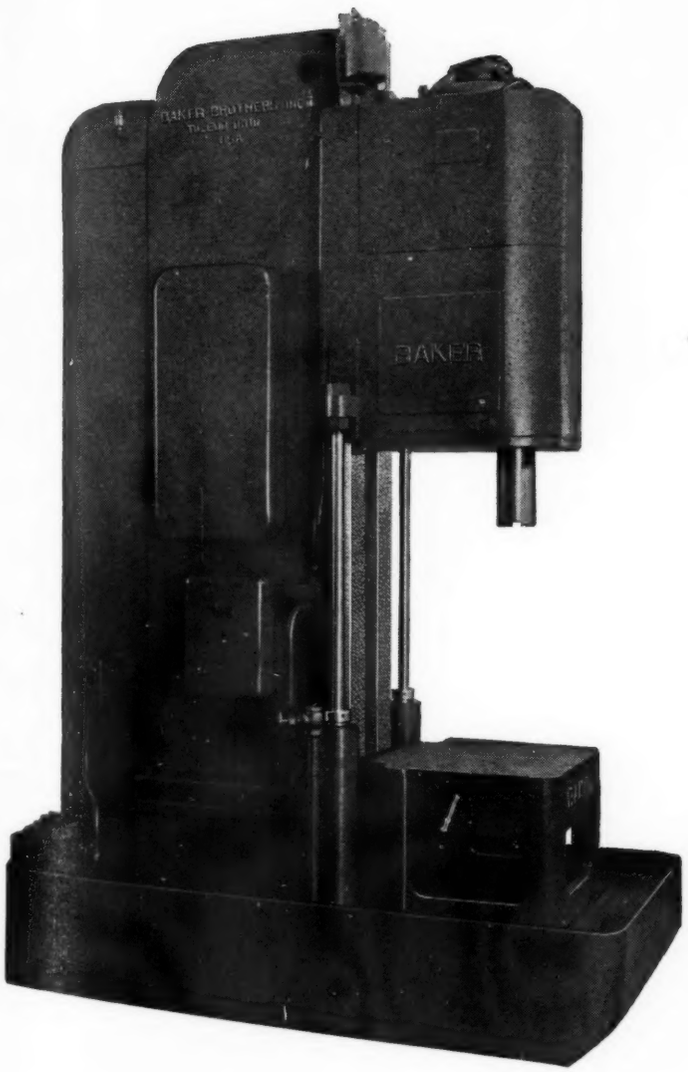
Specifications: automatic chuck capacity, $1\frac{3}{4}$ in. round, $1\frac{1}{2}$ in. hexagon and $1\frac{1}{4}$ in. square; hole through collet tube, $1\frac{3}{16}$ in.; hole through spindle, $2\frac{3}{16}$ in.; number of spindle speeds, 12; range of spindle speeds, 24–600 r.p.m. or 40–1,000 r.p.m.; swing over ways, 18 in.; swing over carriage guides, 17 in.; swing over carriage cross slide, $9\frac{1}{2}$ in.; longitudinal travel, 24 in.; cross travel of carriage, 9 in.; range of longitudinal carriage feeds, 0.0055 to 0.104 in.; range of carriage cross feeds, 0.003 to 0.082 in.; turret turning length, 12 in.; maximum distance from end of spindle to face of turret, 30 in.; range of turret feeds, 0.0055 to 0.104 in.; motor required, 5 to $7\frac{1}{2}$ hp.; net weight of machine without motor or tools, approximately 4,000 lb.

Grob Type NS-14 Metal Band Saw

Having a speed range suitable for cutting all kinds of materials from wood to the toughest high-chrome alloy steel, the Type NS-14 metal band saw offered by Grob Bros., Grafton, Wis., will cut various shapes from 8-in. thick steel down to thin sheet metal. Access is had to an electric brazer, which is built in the upper arm and mounted on a slide, by opening the upper door. A saw blade clamp also is mounted in the frame and a file is furnished to facilitate joining saw bands for internal sawing.

The 20 x 20-in. table tilts in two

It's Smart TO BUY!



It's good judgment to buy Baker machines. Whatever business conditions exist, the wisdom of investment in cost saving equipment is proved by experience. "Baker" means cost saving with the built-in plus of quality.

The standard 30 HO hydraulic feed machine (illustrated) shows the usual sound Baker design. Important details that insure accuracy, speed and long life are also included. Automatic lubrication, helical gears in head, multiple splined spindle mounted on preloaded ball bearings, patented "Twin Pull" feed, and lower drive to spindle—these are not necessary for an ordinary machine. They are, however, required to meet Baker performance standards.

The 30 HO is provided with pick off gears for speed changes; is totally enclosed for safety and easy maintenance; and can be furnished with multiple head, indexing table and special fixtures for special requirements. It is one size of a complete range of standard machines.

For your drilling, boring, tapping, and reaming requirements, consider machines built for better performance. Submit a blueprint or sample part for a recommendation by our engineering department.

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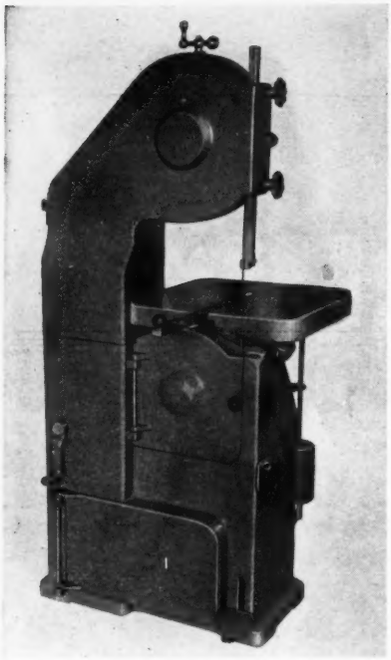


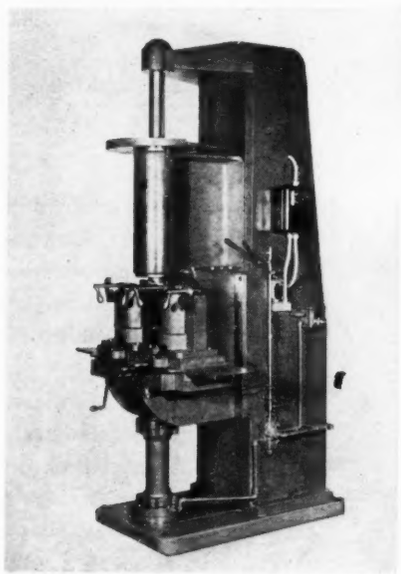
planes. A slot in the table makes insertion or changing of joined saw blades an easy matter. Toggle arrangement in the table feed makes it possible to rotate the work piece without releasing the feed pressure. A hydraulic cylinder checks the feed mechanism, making it impossible for the saw blade to cut into an opening and break by bumping against the other side.

Saw band speeds of 60, 90, 135, 225 and 375 ft. per min. are obtained through a V-belt drive from a ½ hp. motor mounted in the base of the machine. All pulleys are mounted in sealed ball bearings. Distance from floor to table is 42 in. and total height of machine is 69 in. Floor space required is 17 x 31 in. Net weight is 1,000 lb.

N.K.&B. Diamond Boring Machine

Spindle of this diamond boring machine, designed by Neff, Kohlbusch & Bissel, 2255 W. Madison St., Chicago, Ill., is supported in the upper arm of the housing by two roller bearings spaced 24 in. apart. Boring bar is stationary and the housing, with the work supported on the lower arm, slides up and down, the rear guide and pedestal taking the load. Thrust on the bar is taken by a bearing in the upper arm. Hydraulic pressure of 250 lb. per sq. in. maximum is supplied to the pedestal cylinder, which raises the work table for the cutting stroke.

Spindle speed normally is 250 r.p.m., but pulleys can be furnished which will give up to 1,400 r.p.m. Feed can be varied from 0.002 in. to 0.020 in. by a control valve in the hydraulic circuit. Normal stroke of the machine is 14 in. and work up to 20 in. in height can be accommodated on the table. Pedestal base measures 26½ x 43½ in., and the machine is 94 in. high. A Stearns magnetic brake is used to stop the spindle drive motor at the end of a cut.



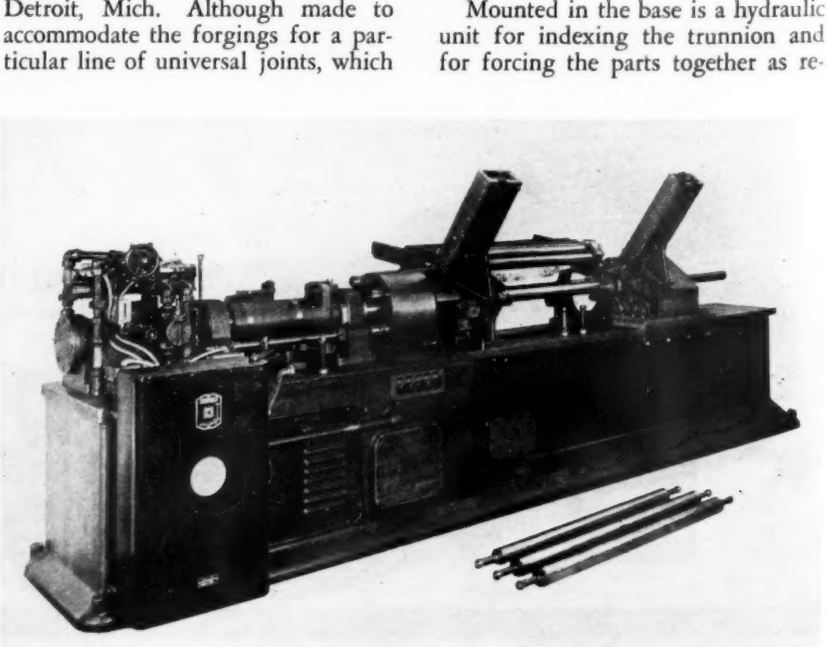
Libert Model 1036 High-Speed Shear

Lower cutting head of the Model 1036 high-speed shear offered by Libert Machine Co., Green Bay, Wis., permits flexibility in cutting formed pieces of sheet metal. It is particularly adapted to the trimming of flash from stampings after the first draw. No starting holes are required for inside cutting and the machine can be used for cutting irregular shapes in the same manner as any standard Libert shear. It will cut on a formed radius as small as ⅝-in. up to 90 deg.

Partool Special Assembly Machine

Designed and constructed for the purpose of pushing together, before welding, the finished forgings and tube which comprise the middle portion of the propellor shaft for a line of automobiles, this special assembly machine was built by Partool Machine Co., 9111 Schaefer Highway, Detroit, Mich. Although made to accommodate the forgings for a particular line of universal joints, which are known as ball heads, the machine can be made to accommodate forgings of other types. Machine consists of a welded steel base upon which is mounted a suitable indexing trunnion, which may be adjusted to suit various lengths of tubing and forgings.

Mounted in the base is a hydraulic unit for indexing the trunnion and for forcing the parts together as re-



LeBLOND WAYS *are* HARD!

85-90 Sclerescope
60-63 Rockwell "C"
600-650 Brinell

Right: Note that strip of high carbon alloy tool steel is ⅛" thick. An impenetrable surface under the most grueling work you can put on the lathe.

HARD EVERY INCH OF THE WAY— HARD TO A UNIFORM DEPTH EVERY INCH OF THE WAY . . . .

LeBlond Ways are built the hard way, and the BEST. Every surface inch of their length and to a uniform depth LeBlond ways are of laminated structure built up of an extremely hard, wear resisting surface of chrome vanadium alloy tool steel on a tough ductile core.

No experiment . . . in eight years we have built many lathes with hard ways that have stood the test of hard service.

Ground on the bed to accurate alignment. No surface soft spots to wear when work demands the most grueling use on one small area of the ways. This dependable plus quality means longer life and continuous accuracy and alignment. And beyond this hardness, the LeBlond specially designed compensating Vee-Way prevents any bind or climb under heaviest cuts, at the same time compensating for the slight wear of the carriage.

This special type of construction can be provided on all LeBlond Lathes where exceptionally hard work is demanded, and for extra hard production it can be furnished on the cross slide as well.

Do more than consider the extra satisfaction LeBlond Lathes can give you. Compare them feature by feature. Know why LeBLOND LATHES LEAD.

It's the HARD way—and the BEST!

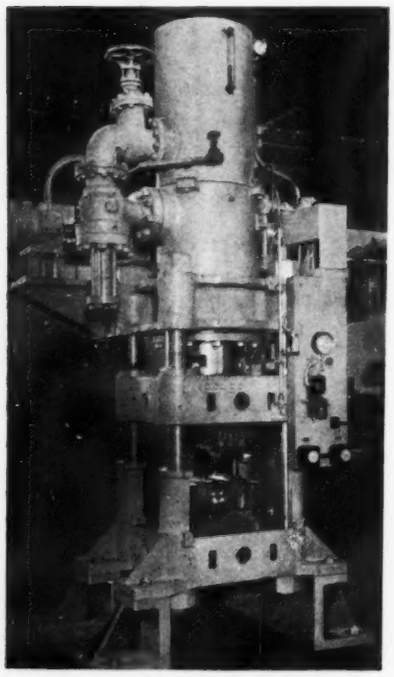
R. K. LeBLOND MACHINE TOOL CO.

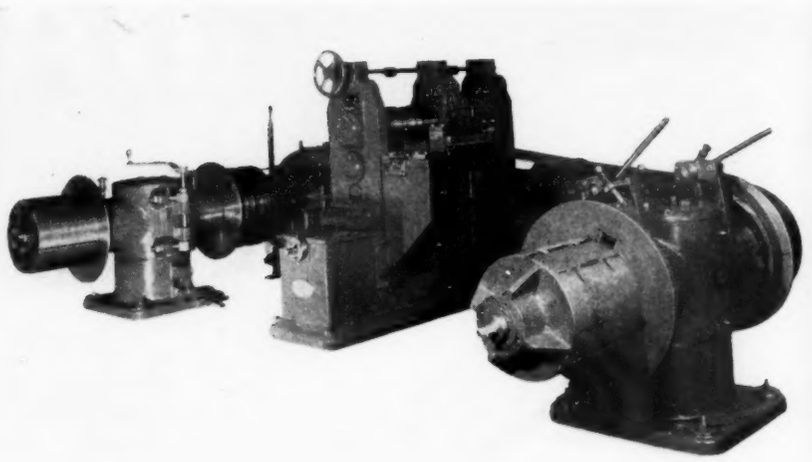
CINCINNATI, OHIO
Dept. H-5

quired. Operation of the machine is fully automatic, it only being necessary for the operators to load the tubes and forgings into suitable magazines. One operator at the front of the machine does nothing but insert the ball-head forgings into two magazines. A second operator places tubes in the magazine at the rear of the machine and removes the finished parts, which automatically are ejected at this side. Machine will cycle from 600 to 1200 times per hour and production is governed only by the ability of the operators to load the required number of parts.

Lake Erie 300-Ton High-Speed Press

Designed for operating at up to 20, 10-in. strokes per min. at full tonnage, this 300-ton, high-speed hydraulic press offered by Lake Erie Engineering Corp., 268 Perry St., Buffalo, N. Y., is suited for stamping and coining, as well as other production operations. Absolute control of power, speed and pressure is said to be built into the sensative controls. Selector control permits the operator to choose jog, single cycle or continuous operation. Pushbuttons located on the control panel initiate these three ranges of operation. Pressure is adjustable up to the full 300 tons; the dwell at the top of the stroke also is adjustable. Maximum stroke is 12 in. and distance between columns is 24 in. right to left and 36 in. front to back. Daylight opening is 27½ in.





Yoder Side-Trimming and Slitting Equipment

Units for uncoiling, side-trimming, slitting and recoiling flat stock are offered by The Yoder Co., 5500 Walworth Ave., Cleveland, Ohio. This group, shown in the accompanying illustration, consists of an uncoiling reel stand, a slitting and edge-trimming machine, and a tension reel unit. The uncoiling reel stand is provided with two or more drums which are swung into the line of the processing machines in turn. While the material on the drum is being uncoiled, it is held in place by a positioning block in the base of the coiler.

The drum that is swung out of line is free to be loaded during the time that the second drum is being operated. All of the drums in this unit are equipped with adjustable drag brakes which allow the drums to pay off at the proper slitting tension. They also prevent over-runs when the processing train is suddenly stopped.

The slitting and edge trimming unit shown in the center of the setup is equipped with a combination entering guide at the front of the cutters, together with a hold down and wiper attachment. This unit guides the material into the slitter and simultaneously cleans the material and places a drag upon the stock as it is being slit. This unit is shown set up for slitting narrow strips and, therefore, it is fitted with solid cutters and spacers. When set up for side trimming, housing-mounted cutters may be used and the width of the trimmed stock may be varied as required.

The tension reel, shown in back of the slitter, also is of the two-drum type similar to the uncoiler. Here the driving mechanism is a unit separate from the coiling drum unit and is connected to the drum which is swung into the slitter line by the simple pull of a hand lever which engages the coupling mechanism. The drum which is swung out of the slitter line is easily accessible for the helper to wire the coils and remove them from the collapsed drum.

Dalrae "Midgetmill"

Similar in size to the "Speedmill" but equipped so that it will drill and bore as well as perform milling operations, the "Midgetmill" milling head offered by Dalrae Tools Co., Syracuse Bldg., Syracuse, N. Y., uses a triple lead thread to operate the hardened and ground quill. A bronze nut, which is actuated by a hardened and ground worm, serves as the feeding member for the quill. This milling head is shown set up on a standard milling machine in Fig. 1. Features of the design include the use of aluminum castings wherever possible and a balanced design in which the weight is dis-

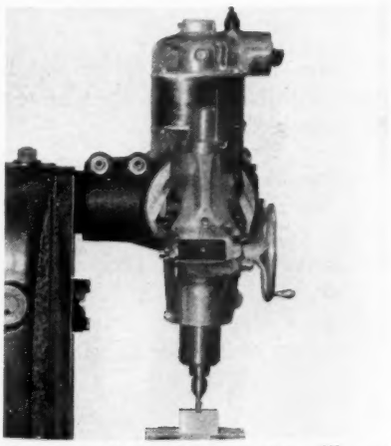


Fig. 1—Dalrae "Midgetmill" will perform drilling, boring and milling operations. Smooth feeding action is obtained through an improved feed mechanism

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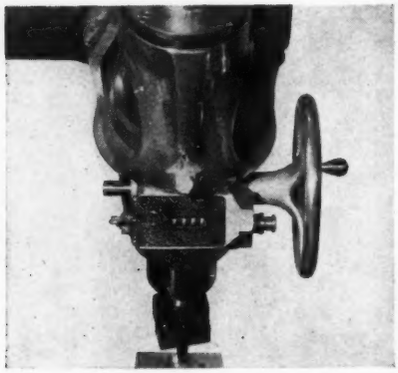
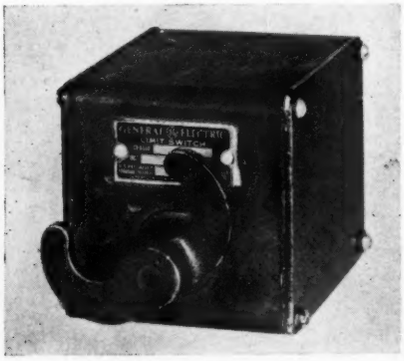


Fig. 2 — A Veeder-Root counter is mounted in the Dalrae "Midgetmill" to replace the usual dials for positioning the cutter

tributed equally on either side of the overarm.

An improved method of positioning or setting up the cutter or end mill is provided through the use of a standard counter, Fig. 2, which is operated from the worm shaft. This method is claimed to eliminate the usual dials or graduations and to provide an extremely accurate, direct-reading device. Tests have shown that the maximum error obtained in 2½-in. stroke is 0.00025 in.

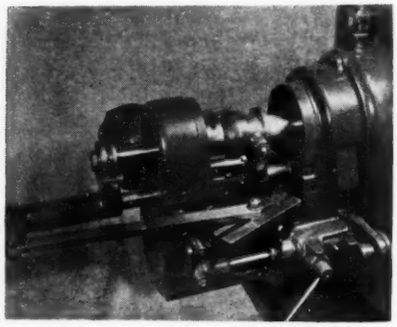


G. E. "Alnico" Limit Switch

General Electric Co., Schenectady, N. Y., offers the CR9440-B1B oil-tight "Alnico" snap-action limit switch for use where a small, heavy-duty reversing switch is required in the control circuit of machine tools and similar equipment. Of single-pole, double-throw design, the switch has silver-faced tips on both the moving and stationary contacts to insure reliable operation and long life. Protection of the switch from oil is obtained by inclosing the switch in a steel case with two gasketed sides and an opening for ½-in. conduit connections. Terminals are easily accessible with side plates removed.

W. & S. Bar Chuck And Bar Feed Unit

The power-driven bar chuck and bar feed unit, shown with guards removed to expose the mechanism and graduated feed arm, can be furnished

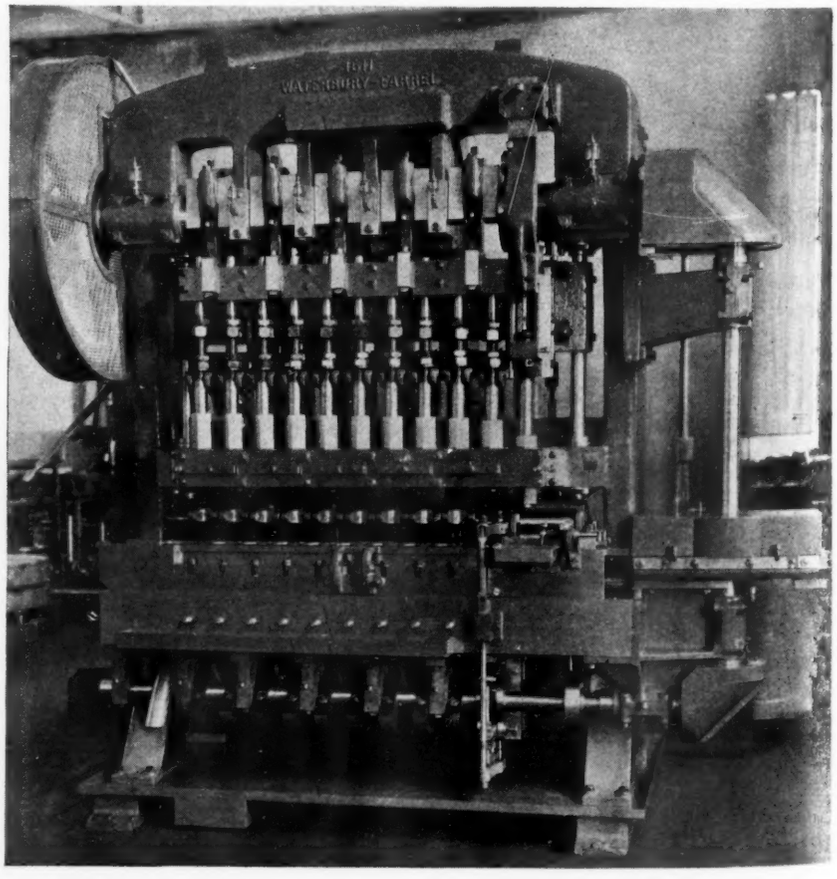


with No. 1 and No. 2 electric and No. 2 all-geared-head turret lathes offered by The Warner & Swasey Co., Cleveland, Ohio. This device is controlled from a single operating lever located near the cross slide. On the No. 1 electric machine, the device also can be tripped by operation of the cross slide, even when tools are used on both front and rear stations.

Bar capacity of the No. 1 unit is $\frac{5}{8}$-in. round, $\frac{7}{16}$-in. square, and $\frac{1}{2}$-in. hexagonal; for the No. 2 unit capacity is 1-in. round, $\frac{11}{16}$-in. square and $\frac{7}{8}$-in. hexagonal. Feed stroke can be adjusted to any length up to a maximum of 4 in. on the smaller machine and up to 6 in. on the larger machine. Longer feeding is possible by operating the lever for more than one cycle.

Waterbury Farrel Crank-Type Multiple-Plunger Eyeletters

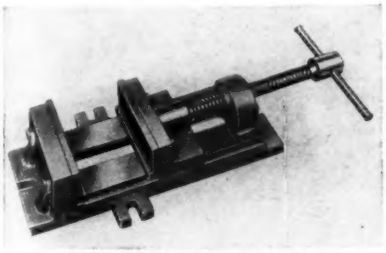
Similar to the cam-type eyeletting machines in operation, but differing in essential working parts, a series of crank-type multiple-plunger eyeletting machines is announced by the Waterbury Farrel Foundry & Machine Co., 425 Bank St., Waterbury, Conn. Power for performing the work is applied through cranks to a two-rod guided gate, or slide, which transmits pressure to the plungers, straight down. Top bearing of each plunger is provided with a heavy spring for the purpose of removing the shock load when starting. For the upstroke and to



provide the dwell necessary for the transfer fingers to operate, the plungers are lifted by a simple bell-crank and cam arrangement. The only cam-actuated plunger is the first or blanking plunger, where a cam roll is used instead of a bumper.

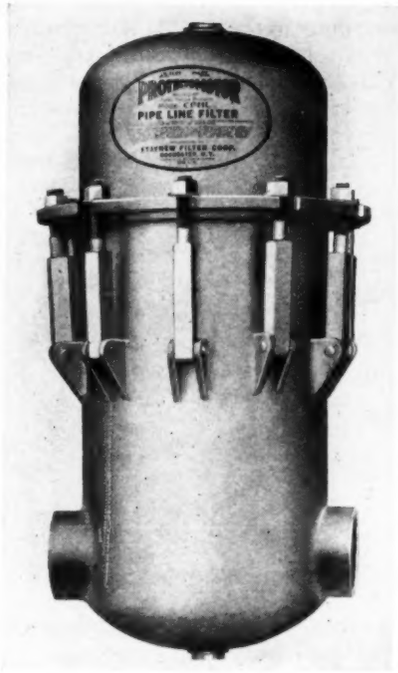
These machines are equipped with roll feed and finger motion so that the metal can be fed through from front to back in a single or multiple rows, depending on the size of the blank. Blanks are cut at the first station, pushed through the die into a transfer block and carried to the second or cupping station, which is provided with a blank-holding device. Work is next carried by means of the transfer slide and snap fingers to the third and successive stations until completed and ejected at the last station.

These machines may be furnished with any old number of plungers within practical limits, but are usually supplied with 7, 9 or 11 plungers. There are four standard frame sizes, of which the largest, No. 200-A, is shown. This machine has a plunger center distance of 5 in., and will handle a $3\frac{7}{8}$-in. wide metal in a single row or $7\frac{1}{4}$-in. wide strip in double-row work. Normal operating speed of this machine for working on ordinary brass is 50 r.p.m. A 15-hp. motor is required.



No. 6 "Simplex" Machine Vise

Replaceable hardened steel plates cover the work base and prevent holes from being drilled into the No. 6 "Simplex" drill press and milling machine vise offered by The Desmond-Stephan Mfg. Co., Urbana, Ohio. Screw is fitted with a bronze bushing which can be replaced easily. Four flanges and T-slots in the base provide for easy fastening in any desired position. Hardened and ground jaws are 6-in. wide and $2\frac{1}{2}$-in. high. Jaw opening is $6\frac{1}{2}$ in. and the vise weighs 50 lb. Offset jaws, or straight-faced jaws can be furnished.

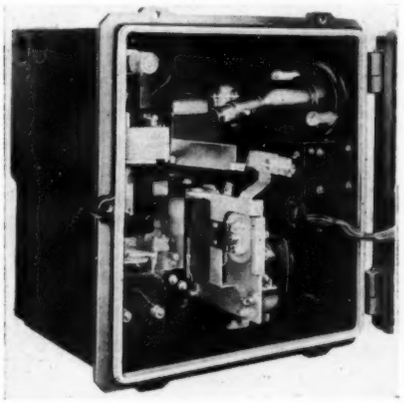


Staynew Model CPHL Liquid Line Filter

Designed for horizontal installation on liquid lines, the Model CPHL "Protectomotor" liquid line filter announced by Staynew Filter Corp., 25 Leighton Ave., Rochester, N. Y., is claimed to be particularly applicable where frequent inspection is necessary. It can be furnished with an automatic drain where required. Paint and oil can be filtered with this unit. These filters are available in capacities from 0.4 to 35 gal. of liquid per min. and have tank diameters from $2\frac{1}{4}$ to $10\frac{1}{4}$ in.

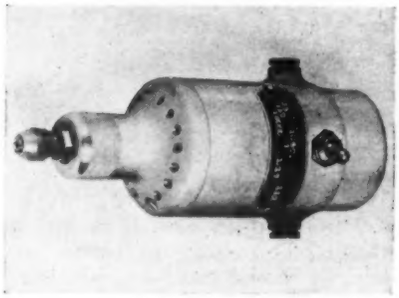
Tagliabue "Celectray" Throttling Controller

Throttling control of electric furnaces and ovens is possible with the "Celectray" indicating photoelectric controller offered by C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y. With this instrument, no other equipment is required than is ordinarily used for on-and-off control. It uses photoelectric detection of the position of a light-beam reflected from a mirror galvanometer toward a reciprocating "controlling edge." With this automatic controller, the heat supply is made to vary inversely as the temperature.



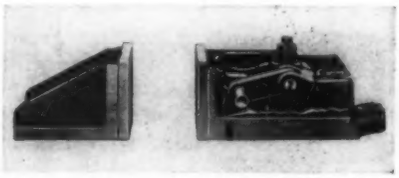
"Themac" Type J-5 Hand Grinder

The "Themac" Type J-5 hand grinder announced by The McGonegal Mfg. Co., 228 Orchard St., East Rutherford, N. J., is powered with a 1/15-hp. universal a.c. or d.c., 18,000 r.p.m. motor. This unit is equipped with a ventilating fan and is said to operate continuously without becoming too farm for the operator's hand. Tool weighs approximately 2 lb. and can be equipped with $\frac{1}{8}$ or $\frac{3}{32}$-in. capacity chucks.



Howe "Clampco" Toggle Vise

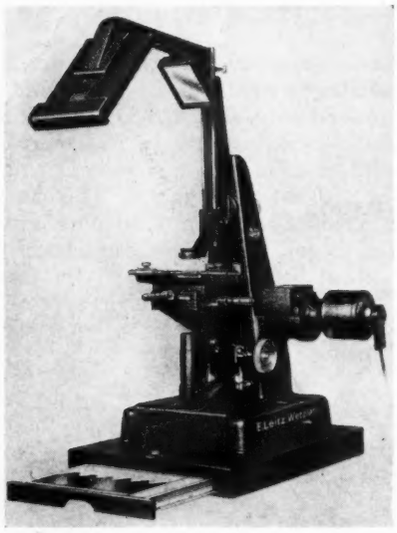
"Clampco" plain toggle vises, offered by Howe Machinery Co., Inc., 30 Gregory Ave., Passaic, N. J., are available in 4, 6, and 8-in. sizes. This vise is extensible for the entire length of the machine tool table and the double jaw depth and pressure



exerted by the toggle is claimed to make this a positive holding means for clamping any type of machine work. Jaw depths are 3, $3\frac{1}{2}$ and 4 in. respectively. Vise and back stop, as shown, make a complete clamping combination for any type of job and any machine that has a T-slot table.

Leitz Simplified Profile Projector

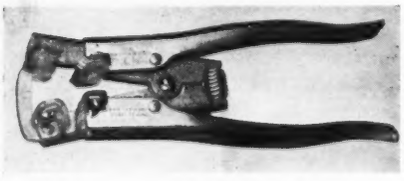
Using a vertical beam of light the Leitz simplified profile projector, announced by George Scherr Co., 128 Lafayette St., New York, N. Y., is intended for inspecting small parts, gears, templets, gages, taps, screws and similar items. Parts to be inspected are placed on top of a compound table having 1 in. micrometer

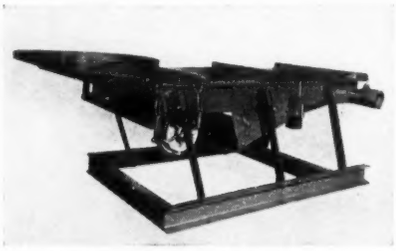


adjustment in both horizontal directions. Contour of the part is magnified from 10 to 100 times in the standard instrument, or up to 200 times in special cases, and projected on a drawing board directly in front of the instrument. Operator compares the outlines with a drawing made to scale and deviations from standard can be accurately measured. Table can be swiveled 12 deg. in either direction, so that a sharp image is obtained on both flanks of screw threads up to 12 deg. helix angle.

Ideal "Automatic" Wire Stripper

Designed so that it will not crush stranded wire, the "Automatic" wire stripper offered by Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill., is provided with a lever which stops the return of the arms until the wire is removed after stripping. At the completion of the stripping operation, the lever snaps quickly back to the normal position. This unit operates in the same manner as a pair of pliers and protects the operator's hands. It clamps, cuts insulation and strips the wire with one squeeze of the handles.



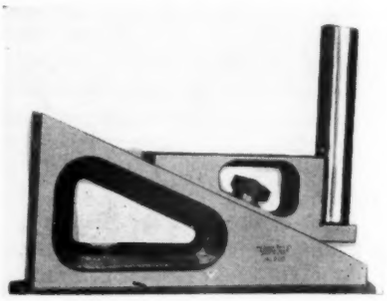


Ajax-Shaler Flat Vibrating Screen

Suitable for either floor, ceiling or wall mounting, the Ajax-Shaler vibrating screen, offered by Ajax Flexible Coupling Co., Westfield, N. Y., is built low to occupy minimum height. Screen unit is driven by an Ajax-Shaler shaker, mounted directly on the bottom of the screen. This unit eliminates the use of eccentrics and imparts a smooth, reciprocating action to the screen by fully inclosed, rotating weights mounted on anti-friction bearings. Screening compactment and drive unit are completely inclosed in dust-and-oil-tight housings. Screen is equipped with round, beaded intake and outlets for dust-tight feeding and discharge through stockings or boots. Speeds and stroke lengths are variable to suit the physical properties of the material being screened and the volume to be handled.

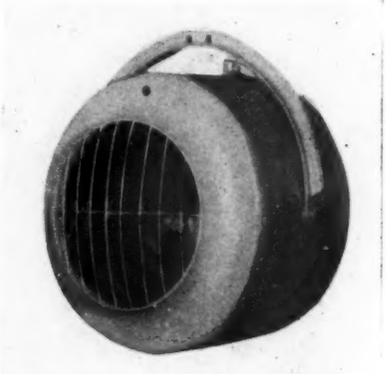
Lufkin "Master" Planer Gage

Offered by The Lufkin Rule Co., Hess & Sheridan St., Saginaw, Mich., the "Master" No. 900 planer gage is claimed to facilitate adjusting depth of the first cut and setting tools for other cuts in all types of planing work. Proper cut is obtained by setting the gage to a micrometer, surface gage or caliper and then bringing the planer tool in contact with the top of the gage. Tool setting ranging from $\frac{1}{4}$ to 9 in. can be made with the use of the extension. Without the extension, range is from $\frac{1}{4}$ to $6\frac{1}{2}$ in. This gage will serve also as an adjustable parallel, since the upper face of the slide is extra long. It can be employed with a sine bar for grinding angles, also with gage blocks for building up work on a surface plate and for transferring measurements with an indicator. Base and slide are of forged steel, hardened and ground. Base is $\frac{5}{8}$ in. wide and $5\frac{1}{8}$ in. long and is fitted with a level.



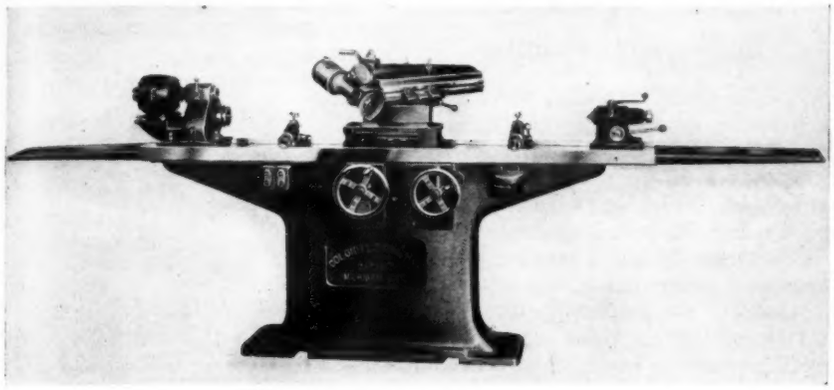
G. E. Improved Industrial Heaters

A forced-convection heater of increased capacity has been added to the line of industrial heaters offered by General Electric Co., Schenectady, N. Y. Including the new unit, three physical sizes of heaters are now available: the small, portable size in ratings of 2, 3 and 4 kw.; the intermediate size, suspension style, in ratings of 5 and $7\frac{1}{2}$ kw., and the new suspension style in ratings of 10, $12\frac{1}{2}$ and 15 kw. All heaters are available



for 230 volts, 60 cycles, a.c. service, the small and intermediate sizes being single-phase and the large size, three-phase.

Capacity of the larger unit is 1,590 cu. ft. per min. with a velocity of approximately 1,780 ft. per min. Throughout the line, "Calrod" heating units are brazed to radiating fins in order to assure maximum heat-transfer efficiency. Motor is totally inclosed, has sleeve bearings, and a baffle plate protects it from direct radiation. Thermostatic cutouts protect the motor from over-heating by accident.



Colonial "Universal" Broach Grinder

Designed to sharpen both flat and round broaches, the "Universal" broach grinder announced by Colonial Broach Co., Detroit, Mich., is provided with a grinding head that is adjustable through an arc of 180 deg. horizontally, permitting complete reversal of the head. This head also is adjustable from a horizontal position to 90 deg. below horizontal. Head is so designed that hydraulic feed for automatic operation may be incorporated. It also is adjustable for side play.

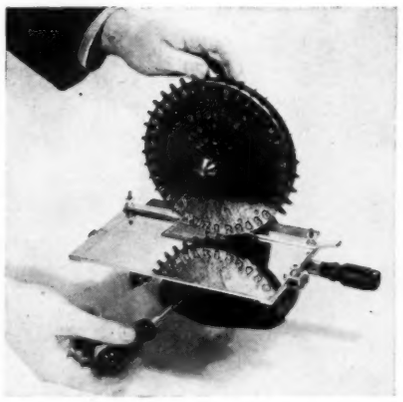
Standard grinding wheels for sharpening broaches are 5 in. in diameter and have a $\frac{1}{2}$ in. face. A $\frac{3}{4}$ in. wheel is furnished for backing off. Grinding wheel spindle is direct motor driven from a $\frac{3}{4}$ hp. 3,600 r.p.m. motor. Frequency changers permit operation of the wheel spindle at speeds up to 10,800 r.p.m. Maximum travel of slide is 10 in. Adjustable stops are mounted on the head and these are fitted with thumb screws, permitting a vernier adjustment of the travel. Permanent stops on the grinding head support are spring loaded to cushion the unit against shock at the end of the travel.

Adjustment of the head column vertically is by means of a hand wheel and maximum range of adjustment is 10 in. Table has a maximum travel of 60 in., with an over-all length of 72 in. Adjustment of the table is through a worm and wheel. For work requiring extraordinary accuracy a vernier worm and wheel mechanism can be supplied to operate the main hand wheel, permitting adjustments to 0.0002 in. A headstock, tailstock and steady rests are provided for grinding round and spline broaches. Headstock is of the two-speed motor-driven type, fitted with a $\frac{1}{3}$ hp. 1,200 r.p.m. motor, and has capacity for swinging work 10-in. in diameter. Tailstock is adjustable, permitting setting broach ends up to $1\frac{1}{2}$ in. off center for tapering broaches.

Bates Name Plate Stamping Machine

An improved name plate stamping machine is offered by H. O. Bates, 68 Barclay St., New York, N. Y. Similar in principle to the machine previously described (*AM*—Vol. 81, page 589), this machine has a dial which holds dies ranging in sizes from $\frac{1}{16}$ to $\frac{3}{16}$ in. and is rotated to the desired letter or figure. Impression is made by a swing of the handle, which also advances the table to stamping position for the next impression. One machine can have extra sets of dies for different sizes and single characters are quickly replaced if damaged.

This machine weighs approximately 30 lb. and is 10 in. high. Nameplates up to 8 in. long can be stamped. Throat depth of the standard machine is 3 in., but this can be increased to 5 in. if desired. The machine will stamp material up to and including $\frac{1}{4}$ in. thick, and it is said that it has sufficient power to stamp stainless steel. Automatic advance is 4 in. A fixture can be furnished to do numbering or lettering at any given radius from $\frac{1}{4}$ to $2\frac{3}{4}$ in.



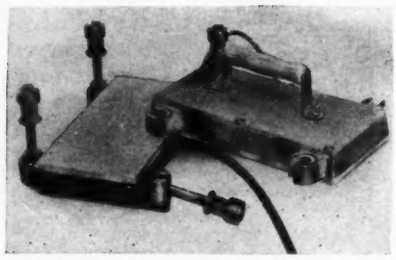
Mall Portable Disk Sander

This portable, universal electric disk sander, offered by the Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill., has a heavy-duty, ball-bearing motor that operates the sanding disk at 4,500 r.p.m. It is said to be comfortable in the hands and easy to operate and control. Standard equipment includes 20 ft. of three-conductor cord and a rubber plug, a heavy-duty switch, a 7-in. pad and one abrasive disk for metal sanding. This unit is recommended for grinding and smoothing-down welds, steel and iron castings, auto body and fender work and for removing rust and scale. A cup-shaped grinding wheel or wire brush can be substituted for the pad and abrasive disk where conditions require.

"Ton-Tex" Portable Belt Vulcanizer

Both the upper and lower platens of this improved vulcanizer for "Ton-Tex", fabric or rubber belts are electrically heated. Offered by The Ton-Tex Corp., 129 W. 22nd St., New York, N. Y., this unit is claimed to eliminate the necessity for turning the vulcanizer upside down to vulcanize the lower side of thick belts that must be joined in place on machines. Unit may be suspended from a hoist for use in hard-to-get-at places.

In operating, the upper platen is swung to one side and the lapped ends of the belt with the cement applied, are laid on the lower platen. The upper platen is then swung into position and the clamping pressure

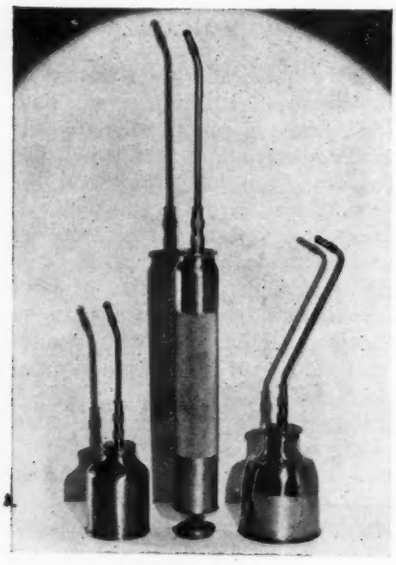


is applied by means of the four corner bolts. Belts 7 in. wide may be joined in one operation, while belts 10 in. wide require two operations.

Acco-Morrow Lubricators

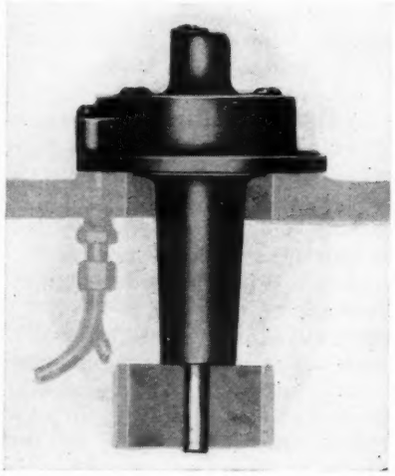
Acco-Morrow pressure lubricators, recently announced by American Chain & Cable Co., Inc., York, Pa., are designed for supplying lubrication at pressures up to 1,000 lb. for bearings, gears and other moving parts. Such pressure lubrication is claimed to flush out grit and dirt from the machine and, at the same time, force oil into the bearings. The "Oilingseal" tip, made of compressible composition is one of the principle features claimed for these lubricators. This tip makes a pressure-tight contact on the top edge of any common oil hole and practicaly all sizes and types of cups and oil hole covers in general use. No special fittings are needed.

Four-gun type lubricators are arranged for supplying pressure of approximately 1,000 lb. and six other models supply pressures of approximately 500 lb. Operating directions are simple: "Just put the tip into the oil hole, make firm contact, then push the plunger slowly." All active parts are made of brass or steel.



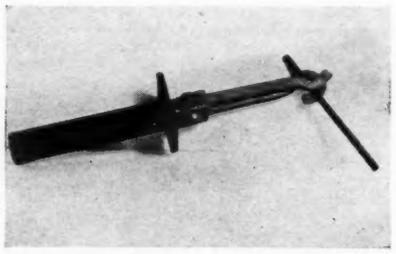
"Rollway" Model ASE Lubrication Pump

Pioneer Engineering & Mfg. Co., 31 Melbourne Ave., Detroit, Mich., offers the "Rollway" Model ASE pump which is designed for lubricating bearings, gears, multiple-spindle drill heads and similar units. This compact unit is a positive displacement rotary pump which may be mounted on practically any flat surface of the machine assembly. Moving parts are made of hardened steel, ground to close tolerances. No gland is required, since the driving gear is inside the machine. This pump is said to be a high-vacuum unit which delivers liquid immediately after rotation is started. Stopping or reversing the machine does not affect pump operation.

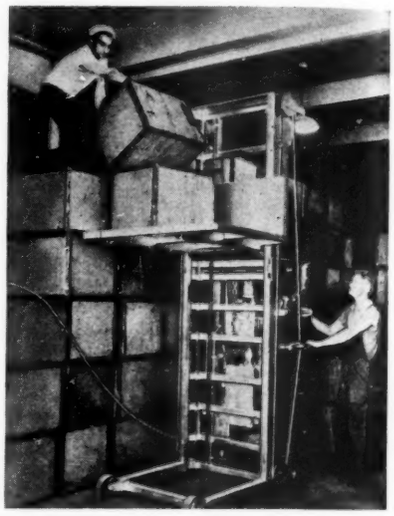


Delong-Cramer Electrode Holder

Made in three sizes to take rods from $\frac{1}{16}$ to $\frac{3}{8}$ in. in diameter this electrode holder offered by Delong-Cramer Co., Southgate, Calif., has a fiber handle and is fitted with replacable jaws. Design of these jaws permits quick



insertion of rods in any position. Handle is air-cooled and has a fiber heat-shield that protects the operator and prevents short circuits if the tool is laid down. The largest size weighs 22 oz. Combination cable connection permits either soldering or clamping, or both. Jaws are made of heat-treated spring steel.

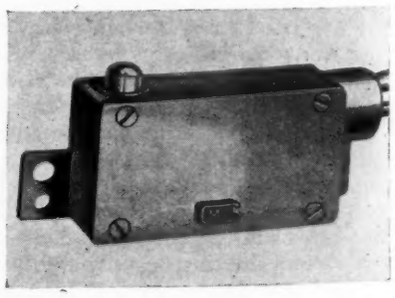


"Service" Electric Portable Elevator

The Service Caster & Truck Co., Albion, Mich., offers a portable elevator unit in which a ball-bearing motor supplies the power to drive a pair of roller chains which lift and lower the platform. Unit is equipped with an electric brake, which operates as soon as the power is shut off, releasing when power is applied. Drive between motor and chains is through an inclosed gear reduction and sprocket. This unit is available in capacities to 1,000 lb. and with lift heights to 30 ft. Heights that are in excess of those that will pass through doorways are made with uprights in hinged assembly, operated by means of a handle and protected against folding while in use.

Micro Type L-K Limit Switch

Switch element of the Type L-K interchangeable precision limit switch, announced by Micro Switch Corp., Freeport, Ill., is the standard "Micro-Switch" which is rated at



½ hp. up to 460 volts a.c. Snap point of this limit switch is held in close tolerance relation to dowel holes in the mounting plate. This is claimed to permit setting this switch to a jig and to eliminate the necessity for adjustability of actuating point.

Switch is sealed into a steel case and is actuated by a plunger, which is sealed against the entrance of normal oil and water. Plunger has a travel of ¼ in., but the switch is actuated by a movement of only 0.001 in. in the forepart of this travel. Unit measures $2\frac{3}{4}$ x $1\frac{9}{16}$ x $1\frac{5}{16}$ in., and is suitable to applications in automatic machine tools where precise limits of motion must be maintained.

Wayne Metal Coating

Developed to eliminate the necessity for cleaning welding spatter from areas adjacent to welds, this metal coating offered by Wayne Chemical Products Co., 9502 Copeland St., Detroit, Mich., is furnished in the form of a light jell which may be applied by brushing, dipping or spraying. It contains water and cools the hot welding sparks as they hit the surface.

Riverside High-Lead Bearing Bronzes

Development of a process of making high-lead bearing bronzes of high quality and uniformity has been announced by Riverside Foundry & Galvanizing Co., 508 Harrison St., Kalamazoo, Mich. These bronzes are said to be compounded from virgin metals. They are available in all necessary grades.

A.-B. "Wiregrip" Carded Belt Hooks

An improved method of carding "Wiregrip" belt hooks has been announced by Armstrong-Bray & Co., 308-310 N. Loomis St., Chicago, Ill. With this system of carding, the desired number of hooks easily can be cut off with a pocket knife or scissors. No special tool is required. Carded first in the usual manner, "Wiregrip" hooks now are anchored in position with an auxiliary card. This card is forced down over the hooks, giving a four-point grip on each hook. It is claimed that the hooks will hold their alignment indefinitely, even though roughly handled.

TRADE PUBLICATIONS

ACCOUNTING "A Statement of Accounting Principles" is the title of a 138-page, paper bound report prepared by Thomas H. Sanders, Henry R. Hatfield and Underhill Moore, and published by the American Institute of Accountants, 135 Cedar St., New York, N. Y. Copies may be obtained from the institute at a price of 75 cents per copy.

AIR POWER "How Air is Being Used in Your Industry" is the title of a 28-page booklet, No. C-60, offered by Curtis Pneumatic Machinery Co., 1924 Kienlen Ave., St. Louis, Mo. This booklet summarizes practical applications of air power in 45 industries that have resulted in increased production, reduced fatigue and cost reductions.

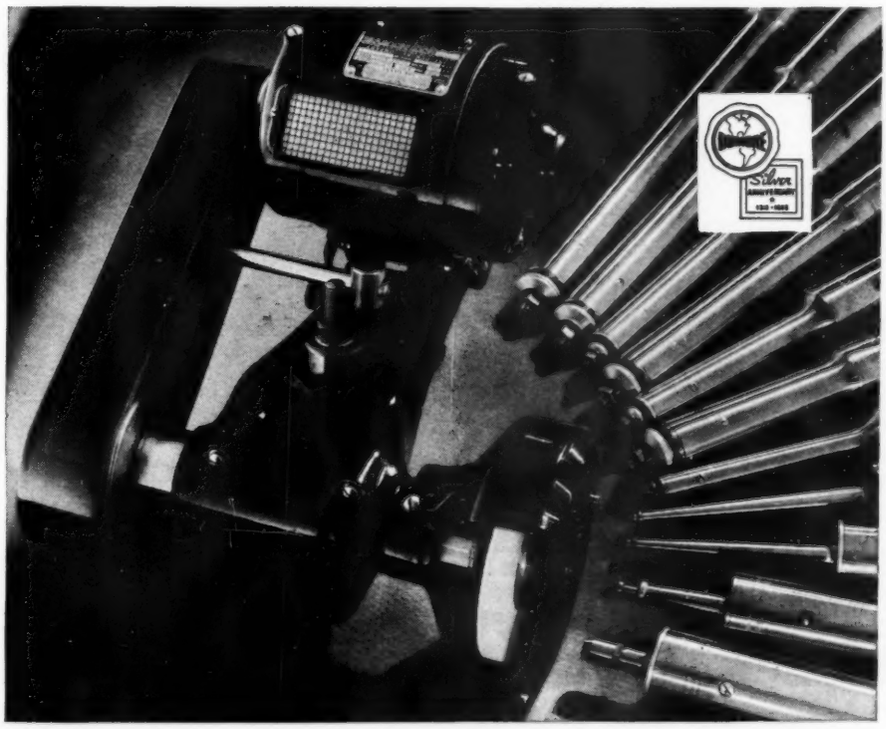
ANALIZER The Rockwell thermal analizer, a direct-reading dilatometer for measuring dimensional changes of material during heat

DUMORE
Does More By 15%

What do you find in the hundreds of shops where high speed grinding, precision to a tenth (.0001) and continuous operation are required? Dumore lathe grinders! One prominent manufacturer who uses a battery in a production line says: "We find that our new Dumore's have increased our units per day about 15%". The No. 7 "Giant"*, with its eleven quick-change quills, is one of the most popular in Dumore's line because (1) it is flexible enough to handle a wide variety of work and (2) it has the power and stamina to "take it". Learn how this or some other Dumore tool can cut corners for you. Write for facts—no obligation.

THE DUMORE CO., Dept. 138-B Racine, Wis.

**AC-DC motor develops up to ¾ h.p. . . . 5,500 to 42,500 r.p.m. . . . easily portable—weighs only 45 lbs.*



changes created by a 3-x 12-in. electric furnace is described in a four-page bulletin offered by The Stanley P. Rockwell Co., Inc., Hartford, Conn.

ARBORS Folder No. 85, announced by Scully-Jones & Co., 1901-1913 S. Rockwell St., Chicago, Ill., lists standard milling machine arbors, arbor bearing sleeves and solid and adjustable spacing collars for milling machines.

A.S.T.M. STANDARDS The January 1, 1938 "Annual Index to A.S.T.M. Standards and Tentative Standards" has been issued by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. This 128-page book includes a list of A.S.T.M. serial designations.

BALANCING Bulletin No. 101, offered by the Globe Tool & Engineering Co., Dayton, Ohio, discusses precision balancing with the Globe super-sensitive dynamic balancer.

BALL BEARINGS Booklet R, a 20-page bulletin offered by New Departure Div., General Motors Corp., Bristol, Conn., contains numerically arranged lists of competitive ball bearings together with the corresponding New Departure numbers. This listing assists in the selection of interchangeable bearings for replacement purposes.

BALL BEARINGS Catalog No. 102, a 66-page booklet announced by Nice Ball Bearing Co., Nicetown, Philadelphia, Pa., lists and describes standard and special ball bearings, sheaves, wheels and casters.

BAND SAWS A six-page bulletin offered by Reed-Prentice Corp., Worcester, Mass., discusses the features of a new precision band saw and die filing machine.

BOLTS AND SCREWS Standard screws, bolts, nuts and allied products are listed and illustrated in a 108-page, 1938 catalog announced by Pheoll Mfg. Co., 5700 Roosevelt Road, Chicago, Ill. Reference section contains information covering standard and special screw threads, tap drill sizes, dimensions, tolerances and other data.

BOLTS Stock-production sizes of machine, carriage and lag bolts of steel are listed in Simplified Practice Recommendation R169-37 made effective Nov. 1, 1937 by the National Bureau of Standards, U. S. Department of Commerce. This publication may be obtained from the Superintendent of Documents, Washington, D. C., at a price of five cents per copy.

CAPACITORS An industrial capacitor manual, offered by Aerovox Corp., 70 Washington St., Brooklyn, N. Y., gives ratings, required capacities, power factors and other engineering and servicing data on motor-starting capacitors. Self-calculating charts are included.

CAMS AND TOOLS Banner Mfg. Co., 1873 Clybourn Ave., Chicago, Ill., has published a 42-page catalog that includes considerable information on cam design as well as listing standard cams and screw machine tools.

CAR WHEELS Bulletin No. 298, published by the Engineering Experiment Station, University of Illinois, Urbana, Ill., entitled "Resistance to Heat Checking of Chilled Iron Car Wheels, and Strains Developed Under Long-Continued Applications of Brake Shoes" is the report of an investigation conducted by the Experiment Station in cooperation with the Association of Manufac-

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turers of Chilled Car Wheels. This 52-page report tabulates test data and is fully illustrated. Price, 50 cents per copy.

CENTRIFUGAL PUMPS Goulds Pumps, Inc., Seneca Falls, N. Y., announces publication of Bulletin No. 210, which gives complete details, data tables and additional information on a complete line of single stage, side suction, ball bearing centrifugal pumps.

CHEMICAL TANKS Bulletin No. B-1 offered by Haveg Corporation, Newark, Del., discusses cylindrical tanks, covers and outlets. Complete technical data are given on cylindrical tanks and fittings.

COATED ABRASIVES "Simplified Prices for Coated Abrasives" is the title of a 30-page, loose-leaf catalog announced by Behr-Manning Corp., Div. of Norton Co., Troy, N. Y. This book includes a comparative grading chart as well as a product list giving application information.

COLD SAW Porter-McLeod Machine Tool Co., Inc., Hatfield, Mass., offers a four-page bulletin which discusses the features of the 8-in. Hickley-type cold metal sawing machine on which improvements were announced recently.

COMPRESSORS Bulletin No. 3815-AM, a 12-page booklet offered by Schramm, Inc., West Chester, Pa., describes portable and stationary "Fordair" compressors using Ford V-8 engines as a basic unit for the compressor drive.

COMPRESSORS Class PRE electric-driven, direct-connected air compressors are discussed in a 56-page booklet offered by Ingersoll-Rand, 11 Broadway, New York, N. Y.

CONGRESS Machinery and Allied Products Institute, 221 N. La Salle St., Chicago, Ill., has published a pamphlet entitled "What Congress Can Do to Build Confidence, Increase Employment and Restore Recovery." This is the statement presented before the Senate Committee on Unemployment and Relief by Wm. J. Kelly, president of the Institute, on January 13, 1938.

CUTTING OILS "Cutting and Grinding Facts" is the title of a 56-page booklet, Form No. A501, offered by the Sun Oil Co., Philadelphia, Pa. Each page shows a photograph of a machining operation and tabulates the results obtained through using the proper cutting compound.

DEMAGNETIZER Vitavox Co., 430 S. Green St., Chicago, Ill., has published a catalog sheet describing the "Vitavox" demagnetizer, which is of the transformer type and will handle dies up to 5 in. thick.

DIAMOND BORING Catalog sheet announced by Neff, Kohlbusch & Bissell, Inc., 2400 W. Madison St., Chicago, Ill., discusses the features of a vertical, hydraulic diamond boring machine in which the boring bar rotates in a fixed vertical position and work is fed past the tool by raising the table.

DIAMOND TOOLS A mailing folder offered by Maurice S. Dessau & Co., 6 Maiden Lane, New York, N. Y., lists various diamond-pointed tools.

DIE CASTING A four-page folder offered by H. L. Harvill, Inc., 2344 E 38th St., Los Angeles, Calif., discusses the features of Harvill high-pressure die casting machines.

DIE-MAKING Continuous die-filing machines and metal band saws are described in an 8-page bulletin offered by Grob Bros., Grafton, Wis.

Every die shop and tool room should have this new bulletin

GEORGE GORTON MACHINE CO.
1103 13th St., Racine, Wisconsin
Send me your new bulletin on Super-Speed Vertical Milling Machines with die and mold duplicating and jig boring equipment.

Name _____ **Company** _____

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DIESEL ENGINES A 32-page bulletin, form No. 4253, offered by Caterpillar Tractor Co., Peoria, Ill., discusses features of the seven current sizes of "Caterpillar" diesel engines.

DI-MET BLADES A four-page bulletin offered by Musto-Keenan Co., 1801 So. Soto St., Los Angeles, Calif., describes the features of Felker "Di-Met" blades for cutting non-metallic products. A number of machines designed for using these blades also are described.

DURONZE ALLOYS The "Duronze Manual", an 80-page catalog and data book offered by Bridgeport Brass Co., Bridgeport, Conn., covers the physical properties and applications of four high-strength silicon bronzes marketed under the trade name "Duronze Alloys." Considerable technical information is tabulated.

END MILLS "Helex" high-helix type end mills are listed and described in a new supplement to Catalog No. 15 offered by National Twist Drill & Tool Co., 6522 Brush St., Detroit, Mich.

EXPANSION LAPS Copper-head expansion laps for tool and die makers are listed and described in a four-page bulletin offered by Boyar-Schultz Corp., 2110 Walnut St., Chicago, Ill.

FIBRE Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y., announces publication of the 1938 Spaulding Engineering Data Book, a 32-page bulletin giving considerable data on fiber, Spauldite, Armite and Spauldo products.

FLEXIBLE JOINTS A 12-page bulletin describing industrial applications of universal joints and flexible drive shafts has been published by Mechanics Universal Joint Div., Borg-Warner Corp., Rockford, Ill. Illustrations show typical applications.

FLEXIBLE WRAPPER "Corroflex" flexible cushion wrapper, for protecting parts in shipment, is described in a circular offered by Sherman Paper Products Corp., Newton Upper Falls, Boston, Mass.

FRICTION MATERIALS Comprehensive data on industrial brake linings and blocks and clutch facings are given in an eight-page bulletin, "Industrial Friction Materials," offered by Johns-Manville, 22 East 40th St., New York, N. Y.

GEARS The Cimatool Co., 1517 E. Third St., Dayton, Ohio, has published an eight-page bulletin discussing precision gear tooth chamfering, burring and milling equipment and methods.

GENERATORS A. C. Generators for Diesel Engine Drive" is the title of form No. B-2116, a 16-page illustrated booklet announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Construction details of electrical and mechanical parts are shown.

GRINDERS Off-hand grinders and lathe tool-post grinders are illustrated and described in a mailing folder entitled "A Grinder and Speed for Every Need" offered by The Dumore Co., Racine, Wis.

HAND GRINDER The No. 8 hand grinder, which is suitable for a large number of off-hand grinding operations, is described in a mailing folder being distributed by The Dumore Co., Racine, Wis.

HOISTS Bulletin No. H-104, publication of which is announced by Northern Engineering Works, 210 Chene St., Detroit, Mich., illus-

"Guide to Treatment" Shipped With the Steel

RYERSON R CERTIFIED STEELS

Ryerson Certified Alloy Steels are not only shipped quickly, but complete information arrives with the bars, including chemical and physical properties and record of heat treatment results. In this way, the heat treater knows what is in each alloy and exactly how to treat it for the best possible results.

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Tees and Zees
Hot Rolled Bars
Hoops and Bands
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RYERSON

trates a number of "Hi-Lift" electric hoists that are available for materials handling in industrial plants.

HOUSING "The Housing Program Versus Rent and Population Trends" is the title of a 16-page booklet prepared by Allen W. Rucker in collaboration with M. W. Pickering, president, Farrel-Birmingham Co., Inc,. Ansonia, Conn. Copies of this booklet are being distributed to industrial executives.

LABOR RATES "Entrance Rates of Common Laborers in 20 Industries, July, 1937" is the title of a report, Serial No. R.682, prepared by the Division of Wages, Hours and Working Conditions of the Bureau of Labor Statistics, U.S. Department of Labor, Washington, D. C.

LAPPING MACHINES Universal shaft lapping machines and crankshaft honing and polishing machines are described in bulletins recently published by A. P. Schraner & Co., 3336 Payne Ave., Cleveland, Ohio.

LATHE CATALOG A profusely illustrated 72-page catalog, No. 97, offered by the South Bend Lathe Works, 426 E. Madison St., South Bend, Indiana, describes the entire line of back-geared, screw-cutting, metal-working lathes manufactured by this company.

LATHES Bulletins discussing the features of the Porter-Cable "Carbo-Lathes" are offered by W. C. Lipe, Inc., 208 S. Geddes St., Syracuse, N. Y.

LATHES "12—14—16 In. Tool Room Lathes" is the title of a 24-page bulletin, No. 488-I-137, published by The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. Principal features of these lathes are discussed and illustrated. In addition, specifications are tabulated and attachments are described.

LIGHTING High intensity mercury lighting equipment is discussed in folder No. F-8409, offered by the Lighting Div., Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

LUBRICATORS Form No. 1700, a 32-page catalog listing lubrication equipment has been published by the Cincinnati Ball Crank Co., Cincinnati, Ohio.

MACHINE TOOLS A mailing folder being distributed by Gisholt Machine Co., Madison, Wis., briefly illustrates the Gisholt line of machine tools. These include turret lathes, balancers, tool grinders and Simplimatic lathes.

MATERIALS HANDLING "Natural Laws Applied to Production" is the title of a 32-page bulletin published by Mathews Conveyor Co., Elwood City, Pa. This bulletin discusses the place of the principal of continuous flow in the modern industrial organization and describes the uses of various types of materials handling equipment.

MEASURING Catalog No. Fe 200, a 128-page, fully illustrated, cloth-bound book, offered by Carl Zeiss, Inc., 485 Fifth Ave., New York, N. Y., discusses the features of a number of types of industrial measuring instruments.

MEDART MACHINES Rotary type, continuous automatic straightening, polishing and sizing machines for bars and tubes are featured in a 12-page catalog offered by The Medart Co., 3500 DeKalb St., St. Louis, Mo.

MERCURY LIGHT A 12-page booklet entitled "Mercury Light for Better Sight" published by the General Electric Vapor Lamp Co., Hobo-

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ken, N. J., describes combination Cooper Hewitt-incandescent lamps and their applications in industry.

METAL COATINGS Technical Publications Series A, No. 67, offered by the International Tin Research and Development Council, 149 Broadway, New York, N. Y., bears the title "Some Differences Between the Structure of Electro-deposited and Hot-Dipped Metal Coatings," and was prepared by D. J. Macnaughtan, Director of Research and Development.

METAL CUTTING "25 Ways to Cut Machining Costs" is the title of a 64-page bulletin published by Continental Machine Specialties, Inc., 1301-7 Washington Ave. So., Minneapolis, Minn. This book is made up of reports describing both conventional types of work and unusual jobs performed by contour machining.

METAL HOSE Bulletin No. 100, offered by Packless Metal Products Corp., 37-14 29th St., Long Island City, N. Y., discusses applications of Packless seamless flexible metal hose and couplings. Standard items are listed for ready reference.

MILLERS A fully illustrated, six-page bulletin offered by Fitchburg Engineering Corp., Fitchburg, Mass., shows special milling machines developed for articular applications.

MILLING ATTACHMENTS The Bridgeport Pattern & Model Works, 50 Remer St., Bridgeport, Conn., has published an 8-page folder which discusses the features of high-speed adjustable milling attachments.

MOTOR SELECTOR "Electric Drive Selector and Hints on Maintenance", is the title of a 12-page booklet announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This pamphlet describes and illustrates the requirements which must be met in selecting a motor and control equipment for a particular application. Ten hints on preventative maintenance are discussed in a separate section of the pamphlet.

MULTI-MILLER Bulletin No. MM-2, an 8-page circular offered by U.S. Tool Co., Inc., Ampere, East Orange, N. J., discusses the features of the "Multi-Miller", a new unit for high-speed production milling.

NEOPRENE Vol. 1, No. 1, of a new publication, "The Neoprane Notebook," is now being mailed by the Rubber Chemicals Div., E. I. duPont de Nemours & Co., Inc., Wilmington, Del. This publication has been planned to give engineering information and application reports on this material.

PHOTOSWITCH A two-page bulletin recently offered by Photoswitch, Inc., 21 Chestnut St., Cambridge, Mass., discusses the features and advantages of "Photoswitch" electronic control devices for industrial applications.

PLASTIC MOLDING Bulletin No. 10-3, offered by Reed-Prentice Corp., Worcester, Mass., is a 6-page folder in which is discussed the features of the No. 10A automatic hydraulic plastic injection molding machine that is capaple of from 300 to 400 shots per hour, depending on the part being molded.

PORTABLE DRILLS Three sizes of utility power drills are shown on a circular being distributed by Black & Decker Mfg. Co., Towson, Md.

POWER PRESSES An 8-page bulletin, No. 203, describing double and triple action, crankless steel power presses is announced by Clearing Machine Co., 6499 W.

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"All Geared"
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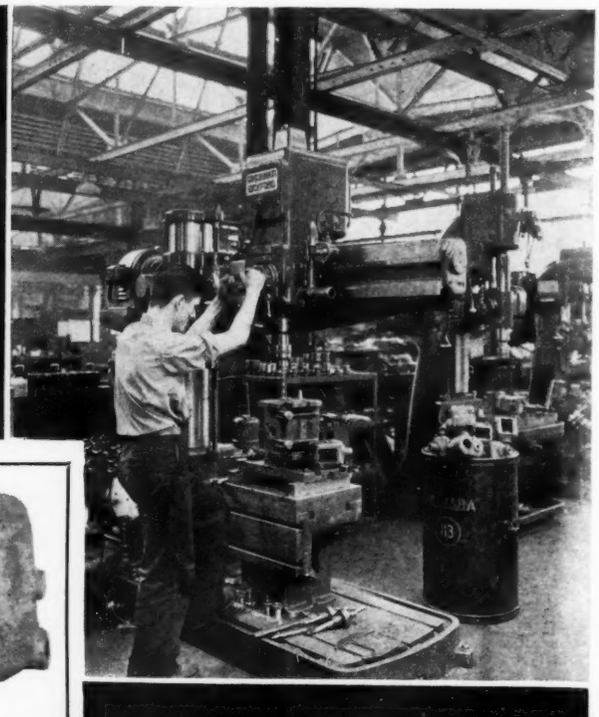
DRILLS



THE JOB
Drill and Tap ½" hole
Drill and Tap 35/64" hole and thread with 35/64 by 18 thread
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Drill and Spot Face 1-⅞" hole
Drill and Spot Face 1-¾" hole
Drill and Tap 2-¼" x 20 thread holes
Drill and Tap 2 ⅜" holes
Drill 2-⅛" oil holes
(Depth of holes drilled varies)

Niagara Machine & Tool Works drills, taps, and spot faces, and reams to limits of ± 0005"

Here is another Super-Service Radial Drill, demonstrating precision performance on a wide range of operations. The Niagara Machine & Tool Works, Buffalo, N. Y. is the user in this case . . and this is but one of their 9 Super-Service drilling machines.

The piece being machined is a cast iron frame for a combination machine.

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Small wonder Cincinnati Bickford Super-Service Radials are widely used for speeding up production and insuring high precision in leading shops. Get all the facts.

The
CINCINNATI BICKFORD TOOL CO., Oakley, Cincinnati, Ohio

65th St., Chicago, Ill. Photographs show typical machines.

POWER PRESSES A 12-page bulletin offered by Verson Allsteel Press Co., 9300 S. Kenwood Ave., Chicago, Ill., discusses the features of a number of types of mechanical and hydraulic presses.

PROFITS "Picking Profits Out of the Air," by F. A. Ebeling, is a pamphlet discussing the economies obtained through proper dust control and being distributed by W. W. Sly Mfg. Co., Cleveland, Ohio.

PUNCHING UNITS Bulletin No. 3803, announced by Progressive Welder Co., 737 Piquette Ave., Detroit, Mich., discusses possible arrangements of hydraulic punching and stripping units for standard and special applications.

RECORDERS Recorders for electrical unit measurements are described in Bulletin No. 496, offered by The Bristol Co., Waterbury, Conn. Operating characteristics of these instruments and their various applications are given.

RECTIFIER "Arlavox" rectifiers for converting 110 volt a.c. to 110 or 220 volt d.c. are described in a catalog sheet published by Arlavox Mfg. Co., 430 S. Green St., Chicago, Ill.

RESISTANCE WELDING An eight-page bulletin offered by the Welding Div., The American Coach & Body Co., 9503 Woodland Ave., Cleveland, Ohio, discusses the features of the "Flexi-Weld" resistance welding unit and portable spot-welding guns.

RIVETERS Rotary vibrating riveters are described in a 4-page bulletin offered by The Grant Mfg. & Machine Co., 90 Silliman Ave., Bridgeport, Conn. Specifications are tabulated.

ROLLER BEARINGS Tyson Roller Bearing Corp., Massillon, Ohio, is distributing a four-page bulletin discussing the features of standard cage-type and cageless tapered roller bearings.

ROLLER CHAINS Catalog No. 617, recently published by the Diamond Chain & Mfg. Co., Indianapolis, Ind., contains 96 pages of information on the use of roller chains for motor drive, machinery and conveyor applications.

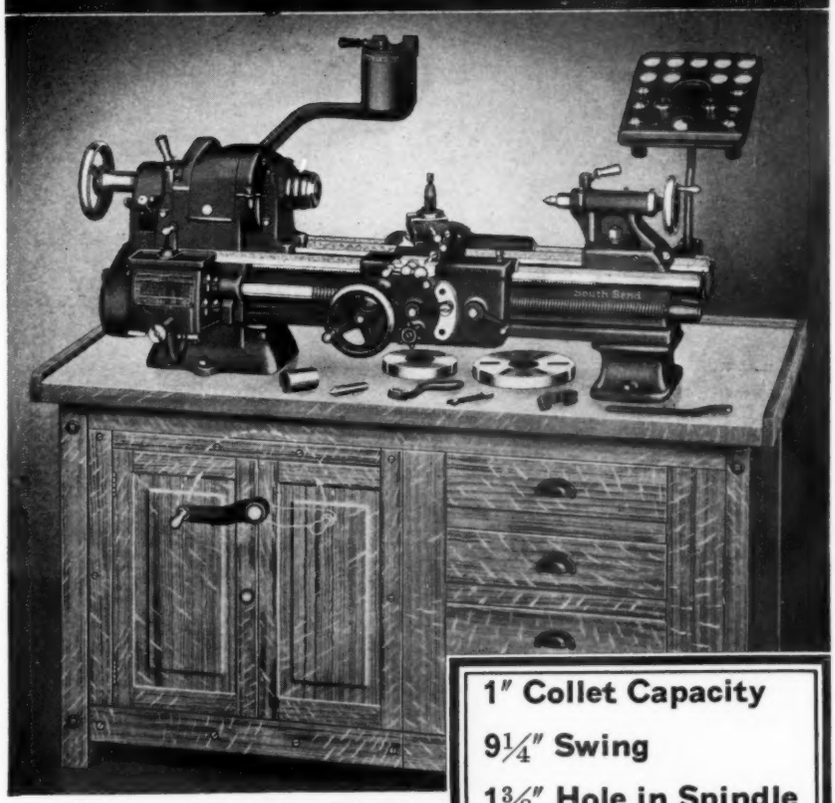
RUSTLESS STEEL A 60-page, well-illustrated handbook on Rustless stainless steel has been published by the Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md. Physical characteristics of a number of steels are discussed and tabulated for ready reference. Distribution is limited to those having a commercial interest in the book.

SAFETY A 34-page catalog listing industrial safety devices has been announced by Willson Products, Inc., Reading, Pa. Photographs show in detail the features of the various products.

SENSITIVE DRILLS The Fosdick Machine Tool Co., Cincinnati, Ohio, has published an 8-page bulletin describing the features of No. 4BM and 5BM high-speed, motor-driven sensitive drills that are available in combinations of 1–6 spindles.

SOCIAL SECURITY Publication of "Social Security in America," a book which summarizes the data collected by the staff of the Committee on Economic Security, has been announced by the Social Security Board, Washington, D. C. This material was used as a basis for the Committee's recommendations which

New South Bend 1" Collet Lathe



9¼" Swing by 3' Quick Change Gear, Underneath Belt Motor Drive Bench Lathe complete as shown above, with Draw-in Collet Chuck, 8 Collets, Collet Tray, ½ H.P. Motor, and Electrical Equipment, less bench. Wt. 680 lbs. f.o.b. factory..... **$656.50**

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9¼" Swing
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THIS new 9-inch lathe is a back-geared Screw-Cutting lathe with all engine lathe features, and is recommended for the manufacturing plant and the tool room. Draw-in Collet attachment available in Hand Wheel Type and Quick Acting Lever type. Six tool bed turret and Double Tool slide adapt lathe to multiple operation manufacturing jobs. Telescopic Screw Type Taper Attachment and other attachments also available.

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Catalog No. 97 illustrates, describes, and prices the new 9-inch South Bend Large Spindle Hole Lathe in Underneath Belt Motor Drive, Pedestal Adjustable Motor Drive, and Countershaft Drive Types, and in 3', 3½', 4', and 4½' bed lengths. Copy sent free, postpaid.

SOUTH BEND *Precision* LATHES

resulted in the passage of the Social Security Act. Copies may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 75 cents.

SPECIAL MACHINES The Grant Mfg. & Machine Co., 90 Silliman Ave., Bridgeport, Conn., offers a 4-page bulletin describing special machines built for multiple rivet spinning, multiple drilling and countersinking, tube flanging and pneumatic riveting operations.

SPEED REDUCERS Catalog No. 68, recently issued by the Stephens-Adamson Mfg. Co., Aurora, Ill., describes J.F.S. variable speed reducers.

STEEL A. Milne & Co., 745 Washington St., New York, N. Y., has announced publication of a 64-page catalog and heat-treating manual that includes data on high speed and high alloy steels, alloy tool steels, carbon tool steels, mine and quarry steels as well as convenient reference tables.

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STEEL A 16-page booklet entitled "A Little Copper in Steel Gives a Lot of Protection" has been published by United States Steel Corporation Subsidiaries, Box 176, 434 Fifth Ave., Pittsburgh, Pa. Applications of U.S.S. copper steel in various industries are described.

STEEL Egleston Bros. & Co., Inc., 539 Borden Ave., Long Island City, N. Y., has announced publication of an 80-page catalog of standard steel products. A number of pages are given over to a discussion of the properties of various types of steels, including a listing of standard S.A.E. specifications.

STEEL Public Affairs Committee, Inc., 8 West 40th St., New York, N. Y., has announced publication of pamphlet No. 15, entitled "Steel —Problems of a Great Industry." This pamphlet summarizes the two-volume study of the steel industry prepared under the guidance of the Bureau of Business Research of the University of Pittsburgh. Price, 10 cents per copy.

TAPPING Bulletin No. 937, offered by the Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill., discusses the features of "Hi-Speed" tapping attachments available for use in sensitive drill presses.

TOOLS Catalog No. 22, a 28-page bulletin offered by Crescent Tool Co., Jamestown, N. Y., lists wrenches, screwdrivers, pliers, hack saws, punches, chisels, tinners' snips and other hand tools.

TUBING "Men, Tools and Tubing" is the title of a folder illustrating various operations in the manufacture of aircraft tubing, now being mailed by Summerill Tubing Co., Bridgeport, Pa.

TUMBLING Lupomatic Tumbling Machine Co., Inc., 4510 Bullard Ave., New York, N. Y., has announced publication of a four-page bulletin discussing the features of various tumbling equipment and supplies for tumble finishing metal parts in mass production.

WELDING An 81-page booklet entitled "Welding Instructions and Standards—Part 1," the first of a series dealing with all phases of welding, is offered by United States Steel Corporation Subsidiaries, Box 176, 434 Fifth Ave., Pittsburgh, Pa. This booklet deals with methods of showing welding on drawings by the American Welding Society's new symbol system. A supplement included in this booklet discusses stand-

ard sections of welds, filler metal properties, workmanship and other subjects not directly connected with the section on welding symbols.

WIRE MANUAL "U. S. Royal Cords and Cables" is the title of an illustrated wire manual offered by the Wire Div., United States Rubber Products, Inc., 1790 Broadway, New York, N. Y. This manual tabulates data of interest to engineers, contractors and purchasing agents.

PATENTS

January 11, 1938

Metal-Working Machinery

Metal Removing Machine (Surface Broach). Alexander Oberhoffken, Rockford, Ill., assigned to the Ingersoll Milling Machine Co., Rockford, Ill. Patent 2,104,756.

Machine for Making Bolts. John H. Friedman, Tiffin, Ohio, assigned to the National Machinery Co., Tiffin, Ohio. Patent 2,104,944.

Apparatus for Forming Sheet Metal Elbows. Charles J. Holub, Columbus, Ohio, assigned to Wheeling Steel Corp., Wheeling, W. Va. Patent 2,104,993.

Convertible Material Working Machine (Bench Lathe). Alvah C. Roebuck, Evanston, Ill. Patent 2,105,009.

Four-Point Hydraulically Operated Press. Isaac Patrick, Mount Gilead, Ohio, assigned to the Hydraulic Press Corp., Inc., Wilmington, Del. Patent 2,105,053.

Fluid Actuated Hammer. Ernest G. Eppens, Easton, Pa., assigned to Ingersoll-Rand Co., Jersey City, N. J. Patent 2,105,074.

Metal Cutting Machine (Vertical Shaper). William H. Welch, Rochester, N. Y., assigned to Cochrane-Bly Co., Rochester, N. Y. Patent 2,105,237.

Method of and Machine for Bending Sheet Metal. Harold G. Flagler, Chicago, Ill. Patent 2,105,240.

Parts and Mechanisms

Gear. Ernest Wildhaber, Irondequoit, and Allan H. Candee, Rochester, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,105,104.

Welding Nut. Leo Demboski and John Kay, Berea, Ohio, assigned to the Ohio Nut & Bolt Co., Berea, Ohio. Patent 2,105,139.

Variable Speed Power-Transmitting Device. Christian de la Barre de Nanteuil, Versailles, France. Patent 2,105,186.

Spindle Driving Transmission. Carl E. Linden, Norwood, and Raymond H. McClellan, Hamilton, Ohio, assigned to the Fosdick Machine Tool Co., Cincinnati. Patent 2,105,288.

Gear Pump Seal. George F. Maglott, Cranston, R. I., assigned to Brown & Sharpe Mfg. Co., Rhode Island. Patent 2,105,428.

Pump or Motor. Walter Ferris, Milwaukee, Wis., assigned to the Oilgear Co., Milwaukee, Wis. Patent 2,105,454.

Processes

Welding Apparatus (Control). James L. Jones, Washington, D. C. Patent 2,104,749.

Machine for Cleaning and Degreasing Articles. Hanns Höllerer, Germany, assigned to Dr. Alexander Wacker Gesellschaft fur Elektrochemische Industrie, G. m. b. H., Munich, Bavaria, Germany. Patent 2,104,992.

Mechanically Working Metal Article. Fritz Singer, Nuremberg, Germany, assigned to Tubus A. G., Zurich, Switzerland. Patent 2,105,015.

Arc Welding System. Claude J. Holslag, South Orange, N. J., assigned to Electric Arc Cutting & Welding Co., Newark, N. J. Patent 2,105,079.

Tools and Accessories

Welding Apparatus (Electrode Holder). James L. Jones, Washington, D. C. Patent 2,104,750.

Welding and Cutting Torch. Carl R. Richter, Schenectady, N. Y. Patent 2,104,761.

Nichel Anode and Container. William M. Phillips, Birmingham, Mich., assigned to General Motors Corp., Detroit, Mich. Patent 2,104,812.

Buffing Wheel and Process of Making Same. Russell A. Goodman, Cleveland, Ohio. Patent 2,104,925.

Welding Shield. Louis G. Tatter, Chicago, Ill. Patent 2,105,018.

Honing Tool and Method of Use. Kirke W. Connor, Detroit, Mich., assigned to Micromatic Hone Corp., Michigan. Patent 2,105,024.

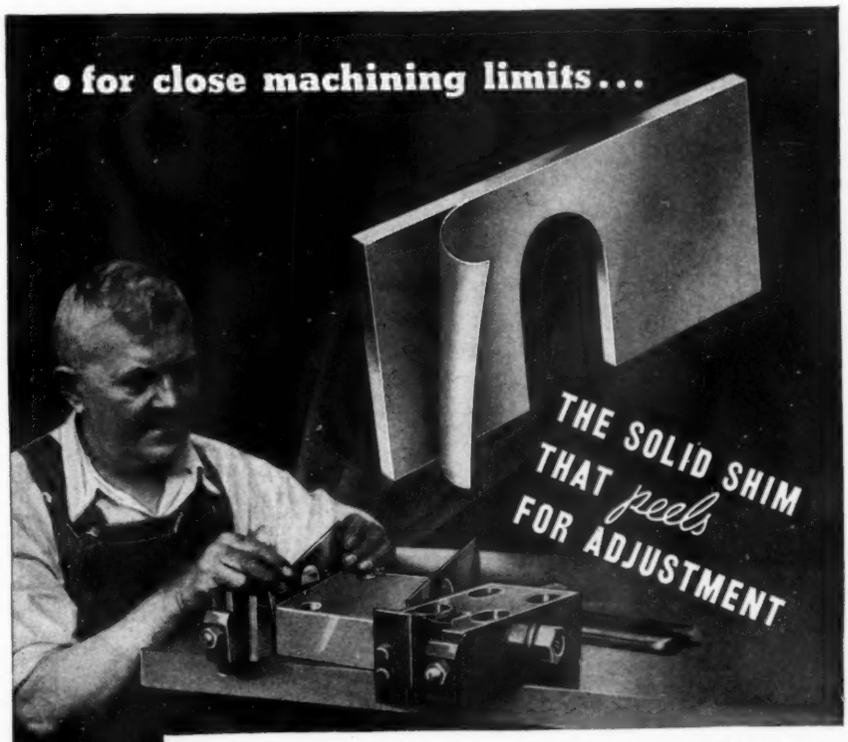
Gauge for Measuring Angles. Meindert Posthuma, Worcester, Mass. Patent 2,105,054.

Filter Glass Holder (Welding). Frederick M. Bowers, Chester, Pa. Patent 2,105,071.

Wrench. Lars E. Hagbo, Bremerton, Wash. Patent 2,105,244.

Press (Die). Edward J. Lobdell, Jr., Alma, Mich., assigned to the Lobdell-Emery Mfg. Co., Alma, Mich. Patent 2,105,289.

Tool Holder (Tap). Walter H. Pagenkopf, La Grange, Ill., assigned to Teletype Corp., Chicago, Ill. Patent 2,105,330.



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January 18, 1938

Metal-Working Machinery

Die Casting Apparatus. John R. Daesen, Oak Park, and Leland E. Wemple, Chicago, Ill. Patent 2,105,586.

Surface Abrasive and Polishing Machine. Vernon R. Pallas, Cortland, N. Y. Patent 2,105,612.

Machine for Honing Conical Surfaces. Herman A. Ortegren, Detroit, Mich., assigned to Bower Roller Bearing Co., Detroit, Mich. Patent 2,105,753.

Machine for Honing Conical Surfaces. Thomas Zimmerman, Detroit, Mich., assigned to Bower Roller Bearing Co., Detroit, Mich. Patent 2,105,762.

Automatic Line Bearing Grinder. Conrad L. Ott and Harold E. Balsiger, Waynesboro, Pa., assigned to Landis Tool Co., Waynesboro, Pa. Patent 2,105,841.

Grinding Machine. Arthur L. Warner, Carpentersville, Ill., assigned to Illinois Iron & Bolt Co., Carpentersville, Ill. Patent 2,105,872.

Electric Welding Machine. Isaie J. B. Demers, St. Paul, Minn., assigned to Superior Metal Products Co., St. Paul, Minn. Patent 2,105,907.

Lathe. Frank A. Fritzsch, Cincinnati, Ohio, assigned to the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. Patent 2,105,913.

Spring Making Apparatus. David G. Morgan, San Francisco, Calif., assigned in part to Noble Mahlmann and Edward J. O'Leary, San Francisco. Patent 2,105,951

Rail Grinder. Arthur William Mall, Chicago, Ill. Patent 2,106,034.

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RIVETT
LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

Adjustable Finishing Machine (Grinder). Gustave A. Carlson, Detroit, Mich. Patent 2,106,082.

Parts and Mechanisms

Lubricator (Airline). Warren Noble, Michigan City, Ind., assigned to Sullivan Machinery Co. Patent 2,105,490.

Lubricating Apparatus (Airline). Mervin Chester Huffman, Claremont, N. H., assigned to Sullivan Machinery Co. Patent 2,105,491.

Speed Control System. Erwin Gerlach, Berlin-Siemensstadt, Germany, assigned to Klangfilm G. m. b. H., Berlin, Germany. Patent 2,105,529.

Lubricating Valve. George H. Acker, Shaker Heights, Ohio, assigned to the Farval Corp., Cleveland, Ohio. Patent 2,105,577.

Labricating System. David R. Hills, Detroit, Mich., assigned to the Farval Corp., Cleveland, Ohio. Patent 2,105,595.

Flexible Shaft Coupling. Herman J. Scholtze, Berkeley, Calif. Patent 2,105,702.

Fastener. David R. Stamy, Huntington Woods, Mich., assigned to Chrysler Corp., Detroit, Mich. Patent 2,105,706.

Tool Slide. Robert G. Le Tourneau, Peoria, Ill., assigned to R. G. Le Tourneau, Inc., Peoria, Ill. Patent 2,105,744.

Sectional Drive. Paul Simonds, Milwaukee, Wis., assigned to the Oilgear Co., Milwaukee, Wis. Patent 2,105,824.

Fluid Controlling Valve. Philip Keith Saunders, Wolverhamton, England. Patent 2,105,864.

Shaft Bearing. Charles C. Barber, Rockville Centre, N. Y., and Charles W. McWilliams, Kearny, N. J., assigned to Bell Telephone Laboratories, Inc., New York, N. Y. Patent 2,105,900.

Roller Feed Mechanism for Roller Bearing Assembling Machines. Axel F. Rehnberg, Rockford, Ill., assigned to Borg-Warner Corp., Chicago, Ill.

Bearing. Joseph Ulfranc Langlois, Hull, Quebec, Canada. Patent 2,105,976.

Drive Mechanism. Donald R. De Tar, Stratford, Conn., assigned to General Electric Co. Patent 2,106,088.

Processes

Method of Making Collets. Frederick G. Silva, Rochester, N. Y., assigned to Davenport Machine Tool Co., Inc., Rochester, N. Y. Patent 2,105,618.

Rust Preventing Composition and Method of Rust Prevention. Robert Edward Sadtler, Selinsgrove, Pa. Patent 2,105,672.

Method of Making Hollow Bodies. Leo C. Shippy, Lockport, N. Y., and Wilmar Oscar Gebbart, Anderson, Inc., assigned to General Motors Corp., Detroit, Mich. Patent 2,105,704.

Method and Means for Honing Gears and For Truing the Honing Means. Everard Stubbs, Springfield, Vt., assigned to the Fellows Gear Shaper Co., Springfield, Vt. Patent 2,105,896.

Method of Making Sinks (Sheet Metal). Vincent J. Graf, Detroit, Mich., assigned to Briggs Mfg. Co., Detroit, Mich. Patent 2,105,944.

Tools and Accessories

Lubricating Device. Elmer G. Gartin, Claremont, N. H., assigned to Sullivan Machinery Corp. Patent 2,105,492 and 2,105,492.

Valve Stem Clearance Jig. Delbert Pointer, Farmer City, Ill. Patent 2,105,502.

Lathe Attachment. Guy O. Enochson, Austin, Minn. Patent 2,105,687.

Gauge or Indicator for Lathes. Benjiman Milton Self, Detroit, Mich. Patent 2,105,703.

Boring Tool. Benjamin F. Tosenberg, Chicago, Ill., assigned to Scully-Jones & Co., Chicago, Ill. Patent 2,105,757.

Stud Setter. Claude I. Hess, Detroit, Mich. Patent 2,105,788.

Spraying Device (Paint). Floyd O. Clizbe and Vaughn Kelly, Chicago, Ill., assigned to Floyd O. Clizbe. Patent 2,105,903.

Diameter Gauging Apparatus. Clifford A. Bickel, Sidney, Ohio, assigned to the Monarch Machine Tool Co., Sidney, Ohio. Patent 2,105,962.

Industrial Truck. Edward H. Remde, Cleveland, Ohio, assigned to the Baker-Raulang Co., Cleveland, Ohio. Patent 2,106,063.

Drafting of Lay-Out Apparatus. Chester A. Spotz, Laurel, Quebec, Canada, assigned to the Chester A. Spotz Syndicate, Ottawa, Ontario, Canada. Patent 2,106,070.

January 25, 1938

Metal-Working Machinery

Apparatus for Broaching an Aperture in an Article Relative to Its Outer Dimension. Carl J. Halborg, Detroit, Mich., assigned to Colonial Broach Co., Detroit, Mich. Patent 2,106,212.

Broaching Machine. Carl J. Halborg, Detroit, Mich., assigned to Colonial Broach Co., Detroit Mich., Patent 2,106,-213.

Roll Grinding Machine. Edward Hutchens, Cudahy, Wis., assigned to Utility Mfg. Co., Cudahy, Wis. Patent 2,106,215.

Honing Machine. Albert M. Johnson, Rockford, Ill., assigned to Barnes Drill Co., Rockford, Ill. Patent 2,106,216.

Machine Tool (Honing). Albert M. Johnson, Rockford, Ill., assigned to Barnes Drill Co., Rockford, Ill. Patent 2,106,217.

Apparatus for Cutting Bar Stock. Lee A. Frayer and Carl L. Harvey, Kent, Ohio, assigned to the Lamson & Sessions Co., Cleveland, Ohio. Patent 2,106,274.

Buffing Method and Apparatus. Horace D. Stevens, Akron, Ohio, assigned to the Firestone Tire & Rubber Co., Akron, Ohio. Patent 2,106,442.

Heat Treating Furnace. Le Roy A. Lindberg, Evanston, Ill., assigned to Lindberg Engineering Co., Chicago, Ill. Patent 2,106,462.

Bending Rolls Machine. Paul Parcells, Chicago, Ill., assigned to Geo. Whiting Co., Chicago, Ill. Patent 2,106,534.

Parts and Mechanisms

Punching Mechanism. Job D. Baker, Gilbertsville, Mass., assigned to Sullivan Machinery Co. Patent 2,106,160.

Feed and Cut-Off Mechanism. Lee A. Frayer, Kent, Ohio, assigned to the Lamson & Sessions Co., Cleveland, Ohio. Patent 2,106,275.

Screw Locking Means. Martin H. Redmer, Chicago, Ill. Patent 2,106,278.

Rope Transmission. Otto Ohnesorge, Bochum, Germany. Patent 2,106,358.

Pot for Die Casting Machines. Louis H. Morin, Bronx, N. Y., assigned to Whitehall Patents Corp., New York, N. Y. Patent 2,106,505.

Automatic Variable Speed Gear. Emile Jacques, Paris, France. Patent 2,106,-603.

Processes

Method of Testing Lubricants. Frederick A. Faville, Chicago, Ill. Patent 2,106,170.

Tools and Accessories

Abrasive Sleeve and Method of Forming the Same. David E. Mulholland, Reading, Pa. Patent 2,106,186.

Unit Abrading Element (Hone). Kirke W. Connor Detroit, Mich., assigned to Micromatic Hone Corp., Detroit, Mich. Patent 2,106,205.

Tool Support. John Q. Holmes, Anderson, Ind., assigned to General Motors Corp., Detroit, Mich. Patent 2,106,214.

Portable Demagnetizer. John T. Beechlyn, Worcester, Mass., assigned to O. S. Walker Co., Inc., Worcester, Mass. Patent 2,106,233.

Drawing Instrument. Alexander P. Bartusch, Lockport, N. Y. Patent 2,106,398.

Electric Soldering Iron. Julius Schubert, Long Island City, N. Y., assigned to Steiner Bros., Inc., Long Island City, N. Y. Patent 2,106,439.

Chuck. William F. Groene, Cincinnati, Ohio, assigned to The R. K. Le Blond Machine Tool Co., Cincinnati, Ohio. Patent 2,106,501.

Universal Tool Holder. Eugene E. Henry, Upper Darby, Pa., assigned to the J. G. Brill Co., Philadelphia, Pa. Patent 2,106,525.

Portable Polishing Machine. Herbert J. Pattison, Detroit, and William K. Barton, Grosse Point Park, Mich., assigned to Briggs Mfg. Co., Detroit, Mich. Patent 2,106,535.

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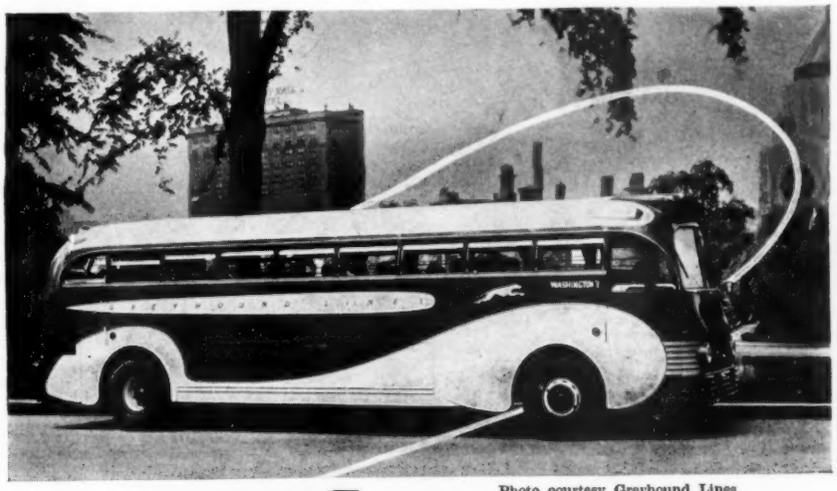
Silver by the Pound

H. C. PARMELEE
Editor, Engineering & Mining Journal

Recently we have been conducting our own private intelligence test. To all and sundry who would listen—engineers, industrialists, manufacturers—we posed the following question: How much does silver cost by the pound advoirdupois in the open market? We specified the open market because all newly mined domestic silver is in a class by itself, being bought by the Treasury at a special price. And now we ask you to answer without resorting to pencil and paper or mental calculation, How much is silver worth by the pound avoirdupois? After you have



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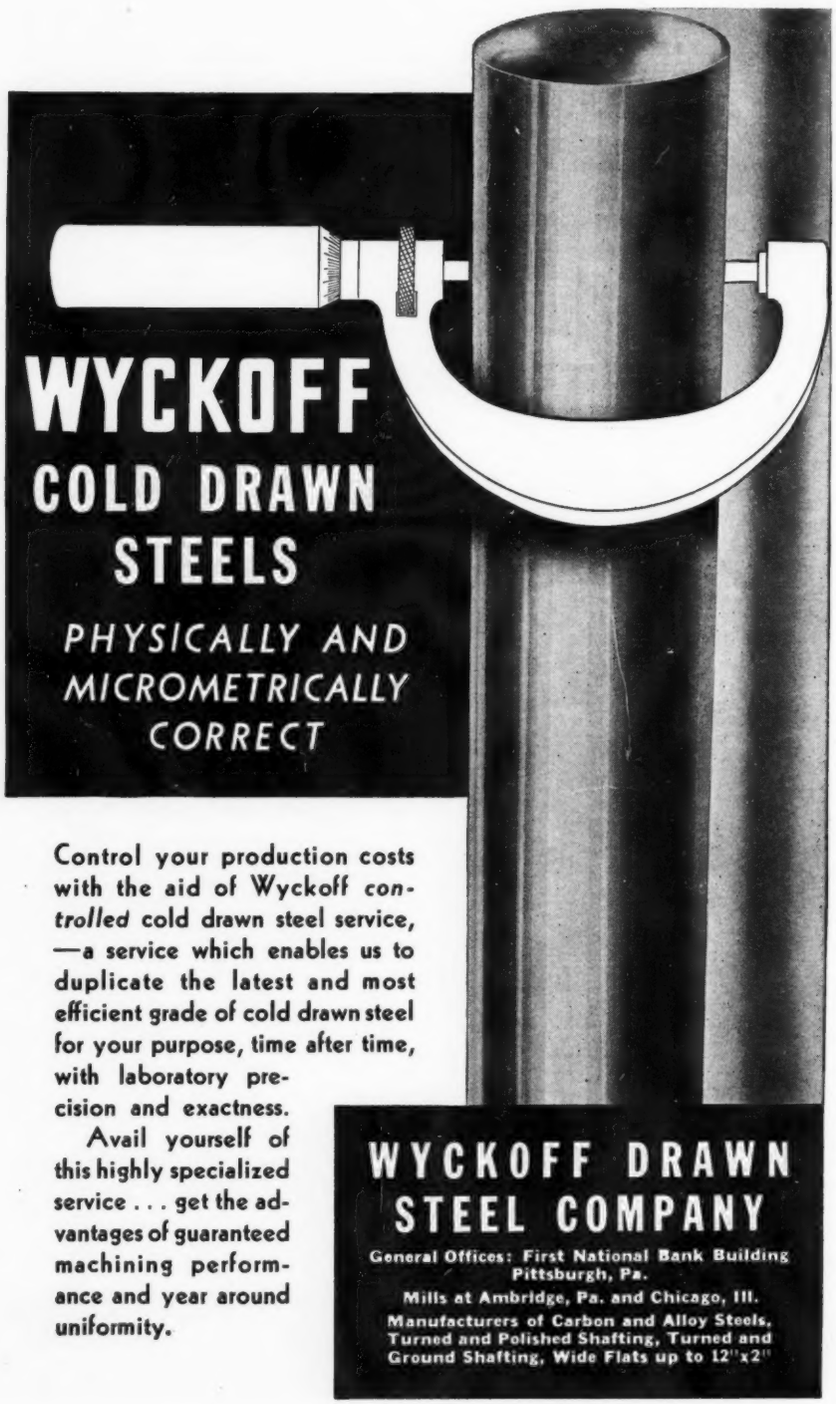
made your guess, figure it out on the basis of 44.75¢ per fine troy ounce. Then try it on your friends. Their answers will probably show a wide range. To many it will come as a surprise to learn that, in round figures, the answer is only $6.50.

Of course we had an ulterior motive in asking the question. We wanted to dispel the common illusion that silver is a costly metal, too costly to be used by the pound for industrial purposes. For, curiously enough, one of the greatest obstacles encountered by those who are trying to promote industrial uses of silver is the common conception that "it will cost too much." This answer is given repeatedly by manufacturers who would not balk at the intelligent use of other less common metals in the same price class with silver. The reason is not hard to find. Silver has always been classed as one of the noble or precious metals. It is commonly linked with gold; not only in conversation, but in monetary systems and for personal adornment. And yet the current price of gold is nearly 80 times that of silver. They are not in the same price class.

In order to get a clearer idea of the relation of silver to other industrial metals with respect to price by the pound, we arranged 30 metals in order of ascending market quotations for comparably pure products. They ranged, in round figures, from antimony at 15¢ to rhodium at $2000. They fell into four price groups, 15¢ to $2.; $6. to $9.50; $15. to $72.; and $510. to $2000. Silver is in the second price group with molybdenum, thallium, titanium, tungsten, and zirconium, and far below the gold-platinum group. Commercially, it is not an expensive metal.

Price per pound avoirdupois for high purity metals
15¢ to $2.00
Aluminum, 20¢
Antimony, 15¢
Bismuth, $1.00
Cadmium, $1.25–$1.60
Calcium, 75¢
Chromium, 85¢
Cobalt, $1.92
Magnesium, 30¢
Manganese, 40¢
Nickel, 35¢
Mercury, $1.00
Selenium, $2.00
Silicon, 16¢
Tellurium, $1.75–$2.00
$6.00 to $9.50
Titanium, $6.00–$7.00
Silver, $6.50
Thallium, $6.50–$8.00
Zirconium, $7.00
Tungsten, $9.00
Molybdenum, $9.50
$15.00 to $72.00
Columbium, $22.00–$25.00
Tantalum, $65.00–$72.00
Lithium, $15.00
$510.00 to $2000.00
Gold, $510.00
Indium, $1440.–$1600.
Iridium, $1312.–$1458.
Osmium, $440.–$800.
Palladium, $384.
Platinum, $627.
Rhodium, $1920.–$2000.
Ruthenium, $608.–$675.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